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AMAZING STORIES

TELEVISION HILL

By George McLociard

The Man Who Annexed the Moon

By Bob Olsen

VOL. 5 NO. 11

AMAZING STORIES SCIENTIFICTION

FEBRUARY

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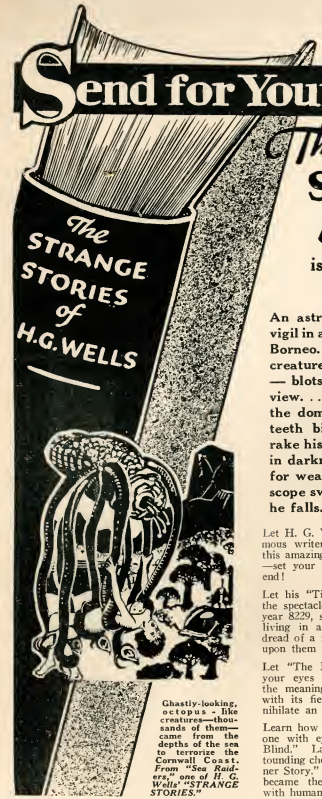

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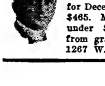

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AMAZING STORIES

Scientific Fiction

Vol. 5 **February, 1931** **No. 11**

In Our Next Issue

THE THING THAT WALKED IN THE RAIN, by Otis Adelbert Kline. Although discussion on glands has passed the "parlor fad" period, the subject continues to be of enormous speculative interest to scientists who are interested particularly in endocrine and thyroid glands. Much has recently been established as fact in the field of possibilities, but the science of glands is still in its infancy and much can be expected in the near future. Our well-known author hardly needs any introduction to our readers. Apparently he has made a study of his subject, and he gives it to us in a most delectable manner.

THE VALLEY OF TITANS, by L. A. Eshbach. The many hundreds of our readers who have been clamoring for more of Merritt will welcome this scientific fiction gem, so reminiscent of Merritt, which goes once more, though in an ingeniously new way, into the possibilities of ruling intelligences that are not housed in what we know as the human body.

THE EARTH'S CANCER, by Capt. S. Meek, U. S. A. Our well-known author is obviously not immune to the all-prevalent interest abroad in the subject of this malignant disease. Far from being a medical treatise, Capt. Meek's offering is an absorbing tale based on the definite findings of our medico friends who devote their lives to the study of this subject.

ATOMIC FIRE, by Raymond Gallun. If you think you have heard enough about atomic energy and its possibilities, you need only read this truly ingenious and original tale to become completely disillusioned as to that. The story is quite scientific and plausible and exceedingly entertaining.

TELEVISION HILL, by George McLociard. (A Serial in 2 parts) Part II. Here's a subject for competition! Will we travel to the moon and the other planets of our universe or will we get our first-hand information first through television? There is no doubt about it! "Television Hill" is extremely thought-provoking.

And other scientific fiction.

In Our February Issue

Our Cover

this month represents a scene from "The Man Who Annexed the Moon," by Bob Olsen, in which the mathematician is shown making, what seems to be a futile attempt to get back to the surface of the moon, which, since he had accidently attained its depth of stygian darkness, seems an exceedingly desirable place to land on.

Cover Illustration by MOREY

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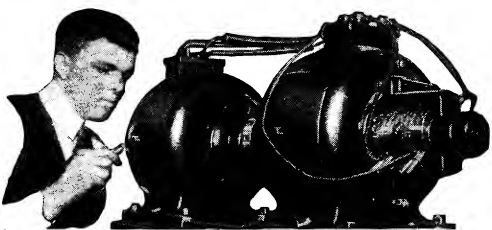

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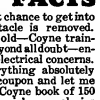

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VOLUME 5

AMAZING STORIES

THE MAGAZINE OF SCIENTIFICTION

FEBRUARY, 1931 No. 11

T. O'CONOR SLOANE, Ph.D., *Editor*

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Editorial and General Offices: 381 Fourth Avenue, New York, N. Y.

Extravagant Fiction Today - - - - - - - - - - Cold Fact Tomorrow

Weight

By T. O'Conor Sloane, Ph.D.

IN the scientific world, where investigations into the laws of nature are being made, where chemistry, physics, astronomy and the many other branches of natural science are all being carried on, the subject of weight is of extreme importance. It is the determination of the weights of different things, referred to some standard, which has built up all modern science. In natural science everything depends on weight. The engineers of old times operated mines, extracted ore therefrom and treated the ore in furnaces and produced metals, sometimes of the very highest quality, but they may fairly be said to have worked in ignorance and not to have known what they were doing. One of the legends of antiquity depicts the conception of weight and of the relations of the specific gravities of different metals. It tells of Archimedes in a bathtub, when he saw that the volume of the water which would overflow from it, if it were brimming full as he immersed himself therein, would equal that of his body.

Things were bought and sold by weight so that in commerce it was early recognized. Archimedes' conception of specific gravity was supposed to be applicable to determine the purity of the metal in the crown of King Hieron of Syracuse, but it is not too much to say that the supreme importance of relative weights in the universe were not realized until within two hundred years.

Men knew that the ashes of a metal, as we may term the oxide, were heavier than the metal itself. But instead of reaching the absolutely obvious conclusion, that as the ashes were heavier than the original metal, of course something had been added to it, they formulated the conception of a theoretical or imaginary substance or property called phlogiston. This was supposed to attach itself to or combine with different substances and affect their weight and other qualities. It is only within the last two hundred years that man mounted to the conception that an increase of weight always meant the addition of another substance, and when Priestly and Levoisier found that an oxide of a metal had nothing to do with this phlogiston, but was a compound of oxygen with the metal, modern chemistry was born. Instead of imagining all sorts of things being done by phlogiston, the entirely obvious idea that a thing is heavier because something is added to it, and lighter because something is taken away from it, was applied to chemistry and for many years chemists worked on the relative weights of the atoms of the elements. Delicate balances were constructed to do the weighing and when man got away from his fiction of phlogiston and took the common sense view of things, chemistry developed with great rapidity and the balance, with its extremely accurate weights, became the foundation upbuilding the work of the chemist. The table of the atomic weights, and there are only 92 of them, one for each of the 92 elements, represents the greatest achievement of the chemical world.

The doctrine of the conservation of matter, which still holds for all ordinary conditions on this earth, falls in line with what has been said. When an oxide is formed, for instance, the proportion of oxygen to the substance with which it combines is referred to the number 16, approximately, of course, because 16 is in round numbers the combining weight or equivalent of the element oxygen. In all the combinations of the ninety-two elements, each one has its own fixed combining weight.

Now leaving the sciences of man's achievements, it is interesting to see how nature follows this law of equivalents. All that nature does, chemical or otherwise, is in strict accord with the laws of equilibrium. The atmosphere of our earth is constantly having added to it carbon dioxide gas, the oxygen of which is derived from the air, so that the air is being robbed of oxygen, and carbon dioxide in equal volume replaces it. Animal life does it. Oxygen is used to maintain the functions of the body; the oxygen is taken out of the air and the body supplies carbon to combine with it.

So here we have an apparent upsetting of things. Our atmosphere is being deteriorated by the beings who depend upon it for their existence.

But there is another division of living organisms which do not do this, but do exactly the reverse. These utilize the carbon to build up their own structure take the carbon dioxide out of the air and evolve oxygen to replace it in the atmosphere.

These organisms are the plants of the world. We can imagine, if the earth were covered with structures so that vegetation was completely destroyed, that an important element in the maintenance of the atmosphere and its standard would be missing. It is fair to say that the luxuriant forests of the tropics, with the vegetation in active work evolving oxygen, counter-balance the arid regions and the arctic and antarctic wastes of snow and ice.

The chemist uses as his unit of weight the gram—which is approximately the weight of a cube of water about four-tenths of an inch on each edge. His laboratory balance weighs down to one-thousandth part of this weight, to one-tenth of a milligram. But in the last few years balances for everyday use by the chemists have been in regular laboratory equipment, which weigh down to one hundred-thousandth of a gram, which is one hundredth of a milligram. For special work balances even more sensitive than this are employed.

This gives an idea of the refinement of chemistry and of the minute units its operations involve. At the opposite end of things we have astronomical quantities, whose stupendous weights exceed our powers of imagination.

The weight of matter, it is fair to say, is the factor at the base of modern science. It is the cornerstone of our knowledge, and as it is referred to the action of the gravity of a rotating sphere, our mother earth, weight varies with the latitude. It seems to be a variable standard for so vital a function.

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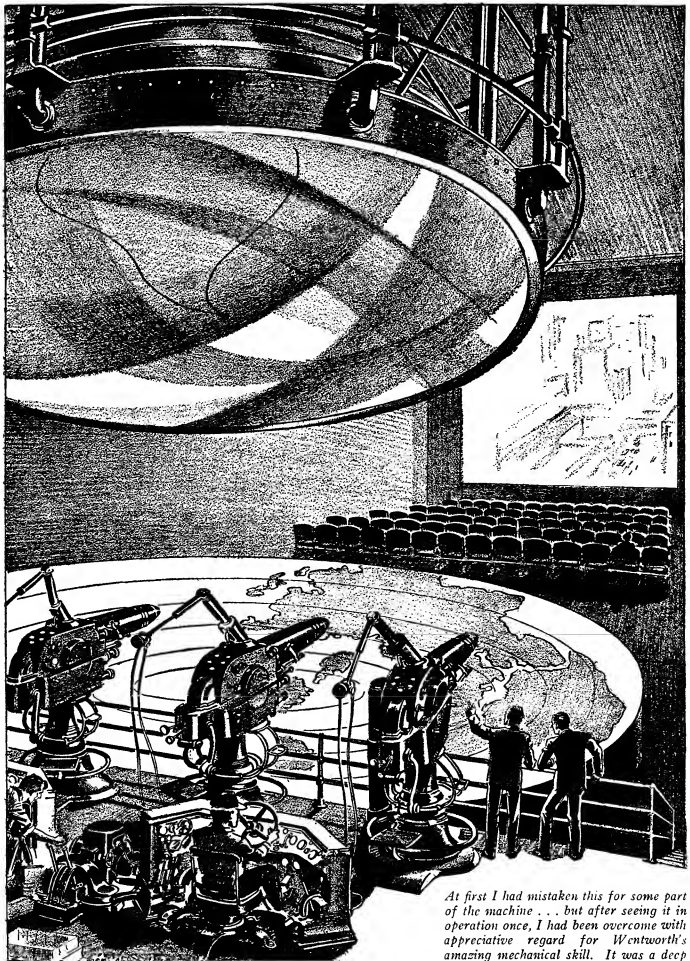


At first I had mistaken this for some part of the machine . . . but after seeing it in operation once, I had been overcome with appreciative regard for Wentworth's amazing mechanical skill. It was a deep set, faintly illuminated map of the world!

Television Hill

By George McLociard

Author of "Smoke Rings," "Terror of the Streets," etc.

TELEVISION is definitely before the minds of the world, particularly since some amazing discoveries made in this field very recently on the west coast. It would require an author to "go some" to surpass in his narration the unexpected strides that mechanical science is making, or to create new amazing features that sound realistic and easily credible. George McLociard, who is the author of "Monorail" and "Terror of the Streets," both published in past issues of AMAZING STORIES, *accomplishes this seemingly incredible feat. Not only does he, in his own words, "go Michelson one better in calculating the exact fraction of a mile in light speed," but with his own distinctive technique and individual method of story writing he makes of "Television Hill" a truly amazing story of absorbing interest and rare plausibility. A new serial in two parts.*

PART I

THE moon, a huge disc of yellow-red glowing low in the clear, star-studded heavens, was slowly climbing over the distant eastern horizon, bathing the world in an ever strengthening soft, revealing illumination. From the heavy growths of pine on the hill and the tall poplars of the winding river valley came the ever-present sigh of the south wind. Extending my feet to the veranda rail, I relaxed with a contented sigh, deeply enjoying the momentary snatch of actual peace of mind and rest coming so pleasantly on this cool mid-summer evening.

"Well, McManus, judging from the way you sit there, it would appear that you were rapidly becoming acclimatized to this place."

My glance went to the slightly indistinct form of a tall man seated on the wide rail, his back resting against the nearest of the supporting pillars.

"Considering the events of this afternoon, and the fact that in time things will be made more and more interesting, there's no reason why I shouldn't take to it," I returned, settling deeper into the comfortable wicker chair.

"Mighty glad to hear that." The faint point of light from his cigar flared out brightly as he struck off the ash.

"This certainly is a quiet piece of country—after being cooped up in tumultuous Chicago all winter and spring," I half-mused, hoping to keep the ball of conversation rolling.

"Yes, it is," he agreed and was silent for some time—lost in reveries, apparently.

"Indeed," he exclaimed suddenly, "it is a quiet place—or so it seems."

I pondered, in a somewhat lethargic state, why he had uttered the last words so softly and why they struck me as being fraught with so much meaning.

"Lonely? Perhaps," he added at length. "That largely depends on how you look at life. Some of us humans are always lonely—even in the big cities."

"The desire to be alone grips all of us at times," I led on, determined to work the thread of conversation to the thing that was uppermost in my mind—the reason why I had been so mysteriously summoned here from Chicago, and why I had been forced to sign so many unusual documents. "Often I have dreamed of discovering a locale similar to this one and have actually spent days searching for it in the lake region around the Wisconsin State line. To tell the truth, Wentworth, the drive south from Rockford along the wide, tree-lined river was simply one thrill of amazement and joy after another, as the majestic, old-world beauty swept past. I had often heard about the beauties of the Rock River Valley but did not realize it was as close to Chicago as it is."

Wentworth remained silent for some time. "Indeed, it is a beautiful strip of scenery and is comparatively little known—or was, until the new concrete road was laid several years ago. When King and I first came out here, there was a narrow gravel road paralleling the river's edge, practically impassable in winter and in bad weather."

As the moon rose higher, the light strengthened and the darkened landscape surrounding us grew more distinct; the river glittered through the openings in the trees, while the thick woods on the rolling slopes to the west took on the strange, unearthly, stereoscopic abruptness only seen in full moonlight.

Wentworth began speaking in his slow meditative manner, and I aroused myself to listen. His first words excited my full attention.

"McManus, it seems as though now would be an appropriate time to acquaint you with some of the work and history we—King, his men and I—have made. You arrived too late this afternoon to make it worth while to take you on an explanatory trip through the plant or to begin to tell you why we appear to be so mysterious in our dealings with you. Besides, I was pressed for time.

"It's a long story and one that, no doubt, will be exceedingly interesting to you, but, I'm afraid that some of the detailing will have to be 'skimmed' over in order to cover as much of the ground as possible. As you have willingly agreed in your contract with us, all information and knowledge of the special research work being carried on by us—whether King or I tell you or you pick it up yourself—is to be kept strictly confidential, and none of your discoveries are to be told to another party—not even to one of our own men—without King's or my consideration and permission. There is a reason for this unusual request—a reason you will readily understand when you have heard my story."

Wentworth stepped into the cottage, returning with a box of cigars, which he placed within easy reach on the smoking stand. His deliberate motions, as he drew up his chair, suggested that the story was to be a lengthy one. The sputtering flame as he lit a fresh cigar highlighted the forceful lines of his rugged features and after a long contemplative puff he began:

* * *

"IT was in the fall of 1923 that King came to me with a wild tale of an experiment he and his son had conducted in their home laboratory. Cyrus King had been interested in things scientific from his early youth and upon the completion of a postgraduate course at Chicago, had turned to teaching, spending twenty-five years at the University of Illinois. In 1922 an explosion, causing more damage to his reputation than bodily harm, forced him into retirement. However, he still retained his love for spectacular experimentation and continued research work at his home assisted by his only son, Jim, who gave promise of becoming a wizard in the newer fields of electro-chemistry. About this time there was a rumor of a successful attempt on the part of the Government in the unusual feat of plating rubber on metals. The processes, for apparent reasons, were kept secret. King, his innate curiosity aroused, determined to duplicate the stunt—if he could.

"Cyrus King is a mild-mannered, keen-thinking, and at the same time, bull-tempered scientist of the rare type, who deem failure but an incentive to even greater efforts. And failure was the only result he obtained, although he and Jim kept up a continual 'siege' at their goal through the entire winter and spring, trying everything and anything in their power, just to see where they had slipped.

"Then, for some reason we have never been able to ascertain, Jim began to experiment with silver and rubber colloidal solutions. King stormed at this display of his son's inconsistency, but the lad, with a knowing grin, kept right on with his 'fooling', as he termed it.

"I was called away to Brazil in early summer and returning in November was met by King who sorrowfully informed me of Jim's marriage and departure to the east, where he was then employed in an experimental electric plant. He was anxious for me to make a special visit to his home as soon as possible and spoke in an indefinite manner of 'a great stunt done by my boy, Jim.'

"'Bob,' he said, as he led the way to the laboratory, when I had finally managed to call several evenings later, 'that lad of mine is a wonder; he's started something so big and so wonderful that, as yet, I cannot begin to believe he accomplished it unassisted.'

"King then pointed to a queer arrangement of flat glass plates, rubber and bakelite boxes, porcelain jars and crocks, and much interweaving tubing; all being enclosed in a tunnel-like shelter of black-painted wood. There were many powerful lamps grouped at one end of the tunnel while the other expanded funnel-like, to take a ground glass sheet some two feet square. I did not even try to guess what it might have been, although it was obvious, from its type of construction, that it was not even remotely associated with rubber plating.

"King did not make any explanations but turned out all the lights save one ruby lamp nearby. As he threw several switches, the lamps within the enclosure blazed out, while pumps began to throb under the table. King thrust his hand through the side door—in front of the lamps—and on that glass screen there appeared, momentarily, a perfect, though somewhat elongated, reproduction of his hand in black and white—in the order of a negative print—reversed in tint—you know.

"Not the least impressed, for I judged the machine to be some sort of a projection device, I asked what there was to get excited about. King turned on the lights and said, 'You are familiar, Wentworth, with the action that goes on when you take a photograph. You place a sensitized celluloid sheet, on which has been deposited silver compounds, behind a focusing medium in a light proof shelter and expose your film for the fraction of a second necessary to take the actinic rays reflected by the object, of which you wish to keep a visual record. Then this exposed film is run through various baths and finally printed on substantial paper.

"'Well, in this machine, Jim and I have been able to combine *all* the chemical changes involved in photography up to the final positive printing—the latter a problem yet unsolved. We can throw on this scren moving reproductions of whatever we place in the *receiving end.* The actual chemical processes only take minute fractions of time, and since my son has hit upon a liquid just as sensitive as the usual celluloid-backed film, and one that can change from the *exposed* to the *unexposed* state by electrical impulse and pump action in the space of a fiftieth of a second—well, we can make use of this startling characteristic in the only logical and satisfactory means of screening a moving image sent or transmitted by wire or wireless!'

"What do you mean? I had asked him, for his talk was not clear to me then, knowing very little as I did about our present 'radio.'

"'Simply this: I have gone far enough into this experiment to see the tremendous possibilities a liquid film holds in screening television images, compared with the precisely ground and delicate revolving glass discs Mr. C. Francis Jenkins is now using.'

"This model, thought King, was sufficient to prove all his claims, wild as they were. Then he went on to tell of how he had previously spent over two months' careful inquiry covering the field wherein photography was used, his efforts being directed to learn where such an unusual film could be put to practical use. He knew, from its inception, that it would play an important part in pro-

jecting an enlarged image on a screen from moving objects placed before the negative plates—if the rest of the complicated mechanism necessary were perfected to the desired requirements. But, then, he had not known where it could be applied.

"After much thought King had acted upon his son's suggestion and called in a group of engineers versed in various lines and bluntly put the problem up to them. One of them brought up television by recounting his experiences along that line. King saw the point instantly and had only awaited my return to start further work.

"During the years King had been teaching, I had been engaged in steel construction work—The Wentworth Engineering Corporation of Illinois. Perhaps you can remember seeing some of my skyscrapers in the loop. I had started off in this game in my early twenties, aided by my Dad, who turned over a considerable part of his estate to my venture, mortgaging me with the condition that I make our name known over the world. King and I had met during college and though we were often separated by continents due to my roamings, our friendship had continued to grow until now, when he has something really big, he has enlisted my help to push this idea. At first I laughed at him, holding I knew so little of the extremely intricate and technical sciences bound to be involved; but he would have none of my excuses and continued, through all that evening, outlining his plans. They interested me—to say the least, and before I realized it, I was as wrought up about the thing as he was.

"You recall, McManus, what thrilling visions the word 'Television' conjured up several years ago. Radio —then widely mistermed 'wireless'—was barely creeping out of the five dollar a 'tube' stage—and the mere mention of television carried us into the misty future of twenty to fifty years. Jenkins was the only active experimenter in the field, and the meager news he suffered the world to know, was eagerly headlined by the radio magazines and other similar publications.

"But to go on. King rented an upper floor of a factory building near North Avenue and the Chicago River, and after much advertising and search, finally selected five men to aid him. He spared no expense, but threw his life-accumulated savings into the maws of his unproductive brain-child. His men, fired with the enthusiasm of a gigantic project, worked ten and often sixteen hours a day. Success, it seemed, was destined to be his fate, for everything ran smoothly along without a single serious hitch, and in late 1924 he was able to screen an entire photoplay sent by wire from one end of the laboratory to the other. It was *wired* television and King could have realized millions had he placed his machine on the market then."

"I'm not stretching the truth, McManus, when I state that King, in that year 1924, had progressed further along in television in regard to oscillators, synchronizing devices, transmitters, receivers, and all the rest of the necessary special lamps than the experimental world has gone, playing with radio today!

"His force had increased to eleven men, all so wrapped up in their work that suggestions and improvements came so rapidly they could scarely keep abreast of them. There was one fellow, Smythe, our present chief-engineer, who occupied en entire room in which he had duplicates of all the various types of tubes and oscillators then known and used. It was in this room that all sorts of utterly senseless and apparently foolish experiments were carried on in the endeavor to find a better photoelectric cell and 'kino' lamps. King spent most of his time in here during the next year, leaving to the other men the lesser problems of ironing out the rough spots in scanning discs, shutters, lenses, pumps, and film liquids.

"Often I had asked King when he would announce his timely invention to the world.

"'Not yet, Wentworth—not yet,' he would say. 'Don't you realize we have barely touched upon the real possibilities surrounding this mighty discovery? I was puzzled at his unexpressed demand for secrecy and would shrug my shoulders at the suppressed smile that lingered in his eyes even through trying difficulties. His fortune dwindled rapidly as expensive machinery was hauled into the old factory building.

"One night, early in June 1925, I paid my usual semi-weekly call, to find the entire two floors, which he now occupied, in a state of general excitement. Everyone was running around hectically, shouting meaningless instructions to each other as they made adjustments to the dynamos, motor-generators, switches, and the numerous other queer contraptions littering the floors and hanging from the ceilings, spread over benches and stands. Cables, encased in thick rubber coverings, snaked over the floors, crawling around timbers and obstructions, through manholes cut between the floors, and even out the windows to the fire escapes. Fine wires and insulated copper and glass tubing were streaking in all directions, making, in all, such an incomprehensible maze of machinery that I just stood and gasped my amazement, although I had seen some of these preparations a day or two previously.

"King met me with a grin. 'Well, Wentworth,' he greeted as he shook my hand with more enthusiasm than I had ever known him to show before, 'The world is ours!'

"'What, er—the world is ours?' I repeated, frowning at the absurd expression.

"'Yes, Old Pal, the world can never again hide any of her secrets in darkened places, nor can mere distances hinder man's knowledge of what is happening on the other side of the globe!'

"'What the Sam Blazes is the matter with you?' I had muttered, grasping his shoulders and giving him a look that would have startled anyone else. He seemed tired, but his body was tensely vibrant with some great joy.

"'Get it, Bob? We've hit the *real* thing! We have Television! The *real* stuff! Right now we are looking upon the lake shore. Come on—take a look.'

"I followed him into the light-proof room where stood the glass screen on which he had a year before projected his movie play, and was surprised to find a shadowy, semi-half tone reproduction of the Lake Shore Drive off North Avenue. It was, at times, so clear, that I could recognize the features of the people wandering up and down the beach walk, and I wondered much at the misty flow of black streaks, odd shapes, triangles, and other queer forms cutting into the picture at close intervals. Then I became aware of the scene moving southward as King made adjustments with a controller similar to that on a trolley car.

"'What,' I exclaimed. 'Since when did you shift your transmitter to a truck?'

"'Now,' said King softly, a slow smile breaking over his face. 'This is the reason of my secrecy—why I did not wish to reveal any details of our discovery—and leads to my long awaited surprise for you. The transmitter is on the *roof* of this building!'

"I stared at him for a long time, realizing instantly just what his words meant. The world was ours! Still, I couldn't believe it! 'You mean to say you can see anywhere you please—without the transmitter being itself on the spot you are screening?'

"He nodded, 'Surely. That is why I say we have the world in our hands.'

" 'Television—sight from afar,' I mused. 'What! It's not possible! Why, look at the difficulties and the unthought of conditions positively prohibiting such a thing. How can you do it? You can't do it!'

"With a smile at the expression of doubt which must have been engraved on my face, King said. 'Remember, that is just what the world said of the airplane twenty-five years ago—and then the learned critics proved it impossible by intricate and exact mathematics. But, human-like they neglected to take into account another important factor in their calculations—the factor of *PROGRESS*. They based their near-sighted convictions on the designs and weights of the machines then flying, never daring to think for a moment that motors could be so developed as to enable horsepower to be drawn from a pound of motor, nor did they dream of metals three times lighter than steel yet of the same tensile strength. There you are. Impossible? We have since gone from those crude contraptions, barely supporting one man in the air less than a minute, to the marvelous giants of today, soaring aloft for hours and transporting hundreds of men. Progress! It is that and nothing else! What may be apparently beyond the power of human intelligence to conquer today, may be so ridiculously simple tomorrow that you feel like kicking yourself about the streets for not thinking of it before!'

" 'If you were standing on the Lake Shore, Wentworth, wouldn't those people look as though they were conscious of some weird machine set upon the beach following their movements? Notice, they do not even glance in this direction with that stare you see so often in news reels.'

"I admitted the truth, but was about to suggest he might be pulling off some colossal practical joke at my expense, when he cut in. 'Now, watch closely, we're going to sweep up the Drive.'

"I'M not going to spoil the new and thrilling treat you will experience to-morrow night, when you see the perfected television machine in operation; so I will not go any further in detail on that point, nor tell you what King and I did in the ensuing months with the extremely crude apparatus. Crude as it was—it was a world wonder, and the men spent hours with us as we 'roved' on the 'Televise' rays within our restricted range of three miles.

"King was elated with his success, and I was almost crazy with interest. Truly, then, was I convinced that the world was ours. King spoke of increased power, of better transmitters, and of the necessary seclusion. Our two strange 'searchlights,' atop the factory roof and their attendant violet-red beams when in operation were beginning to draw comments and questions. Therefore, I told King to go ahead, make his plans, pick out his ground, and order machinery, and I would bear all the expense from then on.

"King and his men, now a select group of forty—a wizard every single one of them—after a month's survey of the entire middle west, decided that the present locality was the most favorable as regards the central point from which to 'cover' the entire area of North America, along with adequate transportation facilities, instant communication, and, of course, seclusion. Then with plans and instructions, I had my construction gang erect the structures to house the machinery. As the winter of 1926 passed on, this hill, once a heavy woods, became a beehive of industry. After much fuss with State officials and the well-meaning War Department, we were permitted to throw a single span bridge across the river to the old State road, which, you know, is on the west bank of the river. A village of a hundred homes was laid out and built down the river about a half mile from here. It is a model town, complete with paved streets, lighting, sewage disposal plant, well water, and is the home of the men employed here. The first unit to be completed was the powerhouse; of a size to furnish a city of a hundred thousand with light and power; its tall exhaust stack rising behind the hill caused much discussion throughout the community. Next came the projection house, and, if you strain your eyes a bit in this moonlight, to the southeast, you can make out the darker shadows of the two water towers rising above the trees. They overlook the three story building wherein much of our work is done today.

"In the meantime, this cottage had been built, and a twelve-foot steel mesh fence was erected around the entire plant area, which covers, in all, some seven hundred acres. A series of secondary fences, where needed, with radio-capacity detection devices, were connected with the office alarm system and the lookout stations.

"On we went about our work constantly and quietly, hiding our plans and identity under the corporate title of 'King-Wentworth-Experimental Radio Engineering,' and thereby put an end to embarrassing questioning by State officials by declaring we were about to attempt radio-beam transmission. It was no lie—we certainly were."

"McManus, you know how such things go. When one is working toward a new goal, how swiftly he stumbles upon other interesting things associated with his quest. That is what happened here at Television Hill, as we have come to call this place. During the years 1926 and 1927 we did very little in expansion of the apparatus we had designed, but spent much time on improving what equipment we had been using and becoming acquainted with the machinery we were installing. New ideas and developments confronted us daily. We were not in the position occupied by the radio manufacturers (with whom we kept constant pace) as much of our amplifying apparatus was based on radio-principles and we did not have a market on which to dump the half-completed and untried efforts of our plant. Our only aim was *perfection;* and our worry—how to keep going. That worry increased with the passage of months and at length I was forced to return to my own business and expand in order to keep up with the heavy drain the experiment was making on my resources. I never had a single doubt but that we'd come out the winners, whether or not we achieved the pinnacle of perfection King was striving for.

"King had made startling discoveries in liquid film projectors, had gone more thoroughly into the investigation of all forms of the so-called 'rays' than anyone else to our knowledge; had whipped the cathode and other associated rays and used them in our research work; had been able to generate infra-red rays in the attempt to improve the Baird System of Fog Television, or Nocto-

vision, I believe it's rightly named, to the extent that we were able to char woodwork two thousand feet away; had played with radio waves, both the extreme long and short; had designed radio tubes and power-oscillators and ballast control valves to fit the unusual demands of our apparatus; and through it all had gathered such a mass of material and notes that when accounts of his experiments are published, much of the theoretical electrical formulae and other standards will have to be revised. Do you know, McManus, that King is about ten years ahead of the whole electrical game? Why, rabid fiction writers, with all their fantastic pipe dreams, could never begin to hope to duplicate in wild rhetorical description some of the astounding achievements we have found possible!

"I think the most spectacular incident I ever witnessed happened here last spring. King's men had found a new type of high frequency oscillator with some characteristics warranting further investigation. A large model was built and set on top of the then wooded Television Hill. In appearance you would have taken it for a crude sixteen foot mortar mounted in the manner of the usual rifle. From the 'mouth' of this strange 'gun' was shot a beam of positive electricity, riding on a 'rod' of ionized air, somewhere in the neighborhood of twenty million volts. It was directed at a tall tree some three miles north of here. There was a puff—a sheet of dull flame, and the green tree had been torn asunder almost instantly. That is a fact which can be verified by just walking down to the village and asking anyone you meet. All our men were witnesses that day."

Wentworth stood up and stretched himself. Reaching into his pocket, he drew forth his pipe and tobacco, filled the pipe, while I watched every move, and lit it. My cigar had gone out long before and the end was soggy from unconscious chewing. Then, too, I realized I was perched on the edge of the chair as close to him as I could have gotten, so engrossed had I been in his story. From the parlor came the melodious boom of the Telechron, announcing the hour of ten.

"Well," Wentworth again settled into his chair. "So things proceeded. The years have fled like months and today, at the end of seven years of relentless work, King has finally admitted he has reached his goal. He has brought his means (and the only means, by the way) of television up to the point where his theories and practices are comparable to the heights now reached by radio engineering. The basic principles are there—there is little room now for radical change—only minor improvements and refinements can be made.

"Today, King and I, are, to the world, poor men. I have disposed of my business, my home, and spend all my time here watching King and aiding him in my little way. Nevertheless, we are the world's most-to-be-feared men. We have three transmitters. One here; Television Hill. One seventy-five miles northwards at New Glarus, Wisconsin. And the last the same distance from these two mentioned stations—at Lake Geneva, Wisconsin. An equilateral triangle of such immense dimensions and untold power as the world has never known.

"We could, at a moment's notice, demand whatever we might from any of a half hundred "shady" individuals in Chicago alone, on whom we could get "inside dope" the press would fight to print. But blackmail is not our object. Television is to be the revealing light of the world—tearing away all the concealed mystery and unfounded superstitious fear holding back the progress of mankind—not to be its all-seeing oppressor and tyrant.

"No, McManus, we hope our machine will never be used for that terrible 'leeching.' King and I have come to be cognizant of the awful potentialities lying dormant in this invention, should it ever get into the wrong hands. And we have taken steps to prevent such a thing happening—if possible. We have made detailed plans of all our equipment, of the chemicals, of the constructional data, and of our other discoveries on a special paper which will change color when once exposed to any form of light, and sent them in sealed tubes to the War Department. They have instructions to build duplicate machines should any emergency arise calling for their use.

"We alone know what terrific forces we have stumbled upon in bringing this modern miracle into being, and well we know that once our secret is made known to the world, we will never be secure from determined efforts to wrest the system from us.

"From this hill, King and I could rule the earth with hand and eye, for, to repeat, we have sole possession of a machine by means of which we can follow any movement on the surface, or under the surface, within the range of our power. *There is no such thing as solid walls to television!* Everything from here to New York could be laid on our screen as though the walls of the house and buildings were made of glass. We could at will, give a complete X-ray examination of any person or object anywhere in a radius of seven thousand miles!"

"That is *TELEVISION!*

"And, then, McManus," Wentworth's voice lowered as he leaned closer, "to climax that—the rays—the carrier beam of the projectors, are potential weapons, by which we can strike as well as see. Cathode rays with all their reputed destructiveness are a mere child's plaything compared to the awful beam issuing from the mouths of our projectors—. But, never you fear, McManus! We have those rays under control so that no harm comes when we are in operation other than a pleasant tingling sensation felt by those persons directly in the focus of the transmitters and only such delicate instruments as milliammeters, galvanometers, and radio receivers give evidence of their presence.

"THAT, McManus, is the reason why such an intimate and disturbingly personal search was made into your past history before you were sent here. We *MUST* be able to trust our employees to go among their friends and relations without revealing that they are involved in something, the revelation of which, would undoubtedly imperil the lives of millions. It is no guess to say it might be the pardonable cause of a war! In that light we have sworn in a select group of the War Department upon their solemn oath to do their best to keep all stories concerning us under surveillance and to contradict all press rumors.

"WE have brought you here to aid us in our latest work—that of supervising the taking and development of miles of motion picture film we are to shoot shortly. We are going into the News Reel game, not because we want to, but because we have decided it is the only way we can rebuild our depleted treasury in order to carry on further development. Our extensive plans call upon us to cover the entire globe with our trio-system of stations within the next ten years.

"We have figured that it would be logical to introduce television to the unsuspecting world by slow stages,

mainly through the medium of news reel productions, rather than to explode the news suddenly. It will, no doubt, take years to do that, by that time we will be able to withstand any forcible attempts to take it from us.

"We are now working on the plans for an immense machine, whose stations will be thousands of miles apart and which will be so powerful that we will be able to penetrate the Heaviside layer and this, in turn, will allow us to see and talk with the nearer planets.

"That, McManus, is what *TELEVISION* really is!"

Wentworth yawned and knocked the ashes out of his pipe.

"Well, I guess that will do for one evening—sleep it off—in the morning I'll make you acquainted with the plant. We have a few planes here and we might hop over to the two other transmitters and look over the sights." He yawned again, then laughed," Gosh, I'm all tired out from talking." He arose, gazing a moment at the face of the moon, now almost directly south. Turning in my direction he said: "It's pretty late, so, if you'll pardon me, I'll say good-night."

At my well-wishing words he turned and went into the cottage.

FOR a long time I sat there smoking, my thoughts ranging between doubt and conjecture. Television? It didn't seem possible! Although my line was principally film development and printing, I had taken a passing interest in other things allied to photography and projection, which I felt might come my way in some future time. Television had always engaged my curiosity and I was aware of the obstacles met with in the eastern laboratories. I had seen some of the "slapped-together" machines presenting poor substitutes of silhouette pictures, and had marveled at them. But to find a man like Wentworth—an ordinary-appearing fellow, a builder in steel, who appeared to have spent most of his life in the open—stating he had played an important part in the development of a perfect Television machine! Well, it was just too astounding to believe! Still, his lengthy story had been filled with the constant remainder that their work was not an overnight discovery; that it was one continuous striving for a definite goal. It was just such tireless, determined labor on the part of Edison that had brought the incandescent lamp to the world, years before it had been expected. And if Edison was able to perform such an unparalleled feat with absolutely no foundation for his work, why could not King accomplish the less amazing task of building a television outfit—backed, as he was, by twenty-five years of close relationship with the most spectacular rise of mechanical and electrical progress ever seen on the face of this globe?

I was getting muddled. A walk, I decided, would clear my head. Then I could sleep. Rounding the cottage, I picked out a narrow gravel path leading to the top of the hill and passed into sudden enveloping darkness as I entered the fringe of trees. It was cool—a pleasant place despite the absence of light. Finally, after much stumbling about, I came upon a clearing running in a wide swath apparently around the hill. Ahead I made out the delicate reflections returned by a closely woven twelve-foot wire fence set in the center of the clearing and it, too, appeared to encircle the hill. Surprised, I turned my eyes up toward the crest to see the reason for the added precaution.

Through the filigree of steel I made out some sort of a wide-spread construction on the hill-top, the details of which could not be readily distinguished in the moonlight. It appeared to be in the nature of a long gun with massive verticals supporting a gigantic searchlight. Figuring I'd see more of it to one side, I started to walk around the fence.

Suddenly—a terrifying shock struck my taut nerves; the night quiet was torn by the rising, blood-curdling shriek of a siren. Alarmed, I stopped dead and listened. It ceased after a lengthy period of lowering its whining burr and from somewhere in the trees came a powerful beam of light, fingering in a questing manner over the well-kept grass, towards me. Bathed in the blinding glare I heard a voice, loud, directed, and metallic as from a mechanical reproducer, "Is that you, Mr. McManus?"

"Yes," I shouted into the tree tops, very much startled and wondering if I were the cause of all this uproar.

"Sorry, Mr. McManus," resumed the metallic voice, signifying my shout had been heard, "but no one is allowed near the fences after night-fall. Uusually we shoot first, then investigate, when we discover prowlers along *that* fence. Better get back to the cottage."

The light snapped out and I watched the glowing point of the filament until it too faded into the night. When my eyes had accustomed themselves to the darkness, I hurried down the path and a few minutes later was trying to calm a wildly thumping heart on the steps of the cottage.

Then, I was ready to admit, whatever truth there was in Wentworth's story, there was certainly enough circumstantial evidence pointing to his veracity.

THE next morning Wentworth grinned at me over the breakfast table. Got caught looking through the hill-top fence last night, eh?"

I felt my face flush with humiliation and managed a dry, unconvincing laugh. "Yes, I didn't think you had this place garrisoned with sharpshooters sitting in hidden lookouts!"

"Well—we have to have some sort of protection. There's no telling what may happen in the night. With those concealed stations, our radio-capacity guarded fences, we think we are fairly safe from unwanted intruders. The only way to get in here after dusk is by passing the two guards at the bridge, or by dropping by 'chute' from a plane or dirigible; neither of which is very practical. The only thing that really could dislodge us now from our position would be long distance bombardment by heavy rifles; but so long as one projector stands in operating condition, we will make our presence exceedingly uncomfortable for the attackers." He grinned and winked meaningly.

I ate in silence, wondering if this machine were not some sort of a Frankenstein monster, whose penetrating eyes were already permitting it to grasp long tentacles of horrible power throughout the world, tearing away all conceptions of personal right and seclusion and sullenly awaiting the moment to thrash out all life within its range.

Breakfast over, Wentworth led the way down the hill to the many stalled garage in which were housed the private cars for their owners' use. My own mud-spattered coupe stood out conspicuously alongside the other five glittering machines. Wentworth, after a glance around, singled out a new flivver roadster.

"Might as well drive as walk," he laughed as we swung out of the doors and up the drive away from the

river. Directly east, through the closely growing poplars and pines, he guided the purring machine up the winding cinder road, and on rounding a sharp left turn, the solid looking three-story building whose western shadow had not as yet allowed the early morning damp to disperse from the trees came into view. A tall steel stack swept upwards of a hundred feet in the air, a faint curl of smoke trailing from its lip.

"THIS is the power plant," explained Wentworth as we came to a stop beside the two-storied steel corrugated roll doors. "There isn't much to see here except the generators and the transformer room. We burn oil in the engines and the heating plant and have a very devil of a time getting the stuff, especially during the winter months, as all of it has to be hauled by tank-truck from Oregon. We haven't been able to induce the Northwestern to run a spur here on account of the nature of the land and the objections from land-owners; so we are forced to tank two months' supply in a reservoir up the hill a bit." As he was talking, we had entered a small office whose slate walls were studded with meters and switches.

Seated at the only desk and engaged in a telephone conversation was a thin, sandy haired, squint-eyed, spectacled man of fifty. He gave us a pleasant welcoming smile and, reaching into a drawer, withdrew a large red-lined graphed sheet which he handed to Wentworth with," Here you are, Bob."

Wentworth studied the sheet while the man continued his talk. Finished, he arose.

"Fine, Alex," nodded Wentworth. "That's just the dope I've been anxious to get. By the way, here's a newcomer to our ranks; Mr. Thomas McManus, who is to take charge of the News Reel Division. McManus, this is Alexander Chalmers, the best Swedish stationary engineer in the States."

Chalmers' wrinkled face broke into a grin. "Better watch your step—that Englishman has a bad habit of stretching the truth." He shook my hand heartily. "Coming in to look at my toys?" he invited, stepping to the door.

At the threshold I paused, looked, and gave vent to my feelings in one long, low whistle of surprise.

Toys? Man alive! Those generators!

There were six of them. Gigantic majesties of iron and copper, hunching their rounded shoulders high into the vast vault of the lengthy building. Back and above each dynamo towered the square and angular piles of the mighty Diesel engines. Three tiers of balconies, guard rails, and steel rod stairways traversed and crawled over their inspiring hulks. Never before in my life had I ever seen anything to compare with them in their very shocking display of power, and I say this backed by ten years of work in motion picture studios, where reproductions of monster sets depicting man's greatest works were common. Standing on that cross-ribbed, rubber-covered floor, the early morning sun slanting through the many-paneled, two-story windows, glittering off the polished brass and chrome-plated instruments and rods, "high-lighting" the cool morocco green and flaming red paint of the motor assemblies. I experienced a thrill in looking upon man's handiwork that went singing down into the depths of my soul.

Man, the creator, becomes a mere wondering creature, a speechless servant to the might that was expressed in these colossal productions of his brain.

Only a single sound broke the cool, ringing silence of the building—the pulsing whine of one generator assembly at the northern end. Men in overalls were leisurely climbing about with tools, making adjustments, wiping dust and oiling bearings.

Wentworth's inquiry, "Amazed at this stuff?" brought me back to earth. His full face reflected his enjoyment at my open-mouthed expression.

"A—little," I admitted drawing a deep breath. "I didn't think it was like this. They certainly are wonderful. Just imagine the power all generate! What make are they and how in the world did you get them here?"

"They are special jobs turned out for us by the Cliff-Clemzon Electric Company of South Carolina, the new giant in the electrical world, and are capable of delivering eight thousand kilowatts at two thousand volts apiece. The Diesels come from Germany and are said to develop around ten thousand horsepower. A story could be told on how we transported these giants in parts and sections by rail and barge and freighter to Davenport and there placed them on barges for the eighty-mile tow up the Rock River to our landing stage from which we hauled and rolled the tons of iron up this hill here. Those were the days of *real* work! Some husky looking jobs, eh?"

"I'll say," I agreed heartily, trying to imagine sixty thousand horsepower gathered under one roof!

"Yet, this is only the beginning of the story, McManus! Suppose we take a look at the transformer section—where the two thousand volts are stepped up to forty-five and seventy thousand?" He led the way through the length of the building, past the long line of six towering generator assemblies, and entered a small red-painted steel door.

Now I was on my guard and did not reveal my surprise when I gazed into the chamber, which must have been forty or more feet high and of the full width of the building. Centered on the concrete floor, with rubber-covered walks was an expansive platform supported on thick five-foot insulating columns. Upon this stage rose criss-crossing steel framing of I-beams and heavy strap screening, upon which were hung the transformers. Two rows of ten, they were twelve feet in height and between and over their corrugated bulks were runways and balconies of glass-flooring and rubber railings. Almost numberless smaller transformers were suspended all over the steel work and the interweaving maze of right angled cooling pipes and the heavily insulated wiring beyond comprehension. I felt as Wentworth must have felt the night he first saw King's television machine spread out in the old factory building. Overhead streaked the high tension wires, perched on top of three foot insulators, to the out-jutting balcony in the north wall. The illumination came from skylights only, the whole chamber falling into a cool, restful silence. I spied the shuttered grating of a huge ventilator opening on the west wall, and decided it must get pretty warm in here when the apparatus was in action.

I turned to Wentworth, a thousand questions ready to pop from my lips.

He cut me short with a depreciating wave of his hand. "This is nothing; you haven't seen anything yet worth mentioning. I'd like to show you about the sub-building which is partly under this floor and extending to the east as a one-story building by the time it goes a hundred feet down the hill. In that building we have an immense bat-

tery of storage cells from which we draw our reserve current when necessity demands.

"McManus, some day you might learn the reason for this tremendous reserve of power!"

"But tell me, Wentworth," I asked. "Do you actually need all this—all this power for television?"

"Yes, McManus, we do. Our system calls for it—every volt and ampere. Kind of disturbing, eh? Matter of fact, it spoils the efforts of our fiction writers who have so nicely made use of vest-pocket television apparatus in their amazing stories. Take it from me, McManus, we will never see the day of a really portable television machine of our type—it's far too delicate and complicated to warrant even thinking about it."

"I don't know why I should feel like apologizing for it, but I have read quite a bit of those stories known as pseudo-scientific and scientific fiction," I grinned, "and have often regretted that they always run in the same channel; the hero, a bulbous-headed mechanical-minded recluse, discovers the secret in a happy thought and straightaway builds the entire machine in a few weeks, or even days, if it is to be instrumental in saving the much-destroyed world, or someone dear to him, and fares forth alone to subdue his enemies. Some have had television 'screens' by which they traveled on light waves and looked upon incidents known to have occurred in ages past! But they all end up the same way; the inventor either dies with the destruction of his machine in a great spectacular consuming climax, or destroys it himself for the good of mankind."

Wentworth had listened with a smile overspreading his good-natured features. "Fiction," he chuckled, "tantalizing, impossible fiction, interesting and amusing to the scientific minded. I read it too. Life may be full of funny tricks but, thank the Lord, it's a whole lot nicer and more reasonable than some of the insane tommy-rot printed in the name of literature." He turned, leading the way back through the generator house and out beside the flivver.

"YOU were going to take a look at our projector last night, eh?" he drawled as he settled into the seat and started the car. Grinning, he turned toward the rear of the powerhouse, over the place where the battery-house lay partly concealed, and took a winding road upward. A few hundred feet on our way we passed four oil storage tanks and seeing them I could not resist remarking that the power-house would be out of luck should they ever explode. Wentworth's sudden glance and instantaneous burst of laughter caused me to wince at the senseless break I had made! He gunned the light car unmercifully and a cloud of dust rose from our wheels as we swung in and about the tree-lined path. Arrived at the high wire fence, the gate was rolled open—apparently by motor drive under control of a sentry somewhere in the vicinity. Again that strange machine, projector I should say, caught my eyes by its very vastness, and now in the revealing light of the sun, I could make out the details of its crude metallic construction.

Inside of the encircling wire fence the entire top of the hill had been leveled off to a perfect plane on which, about fifty feet from the enclosure, ran a circular two-rail track over three hundred feet in diameter. Between the rails, of conventional gauge, was a gear rack whose teeth were so fine that, at first glance, I thought it was the third rail.

Walking along this carefully concreted ballasted roadway we approached the outer end of the projector assembly resting on a mighty ten-wheeled carriage riding the track. Under this truck could be seen the gear-enclosures, guarding the mechanism engaged with the rack. The truck itself formed the sole outer supporting member of the sturdily built triangular truss, bridge-like in appearance, leaping over the intervening space of a hundred and fifty feet to the central pivot. This pivot, I learned as we traversed the boardwalk, slung alongside the truss, was made up of a concealed bearing of massive proportions. Around the bearing a foundation slab of concrete had been laid six feet deep resting on pine piling covering a circular area of a twenty-foot radius. Imbedded in the top of this slab was another set of tracks on which rolled the many-wheeled, heavy, steel, fifty foot circular flooring. To this flooring the lower ends of the truss were riveted and from this pivot-carriage rose two sixty-foot, three-legged towers. These vertical members were circular in section and almost three feet in diameter, hollow, and filled with concrete. They were elaborately braced for stress and strains. And, slung between these towers, was the projector—an affair of thick sheet steel plating—crudely wrought and angular—as large as an ordinary sized house. Above our heads swept the fifty-foot vertical gear quadrant driven through a slot cut in the rambling shack under the projector on the carriage floor.

There it was, silhouetted against the blue of the morning sky like some impossible creation of a giant; so strange and uncouth, I could scarcely believe it was the work of man!

"WELL, what do you think of this?" chuckled Wentworth, when I looked at him again.

"I—er. Really, Wentworth, I don't know what to say! It stuns me by its very size. I've been trying to put my impressions in words but all I can think of is *immense, monster,* and *wonderful.* Tell me something about its 'inner' workings."

"Indeed I will." He took a pack of cigarettes, offered it to me, and we lit up.

"The nature of the 'rays' we use in this machine requires us to shield the oscillators and the tube with quite a bit of lead. In fact, the projector housing alone weighs seventy tons; sixty tons of lead and steel being required to house the electrical outfit, weighing only ten tons complete. That's the reason why this display of strength comes in. Then there is one important factor that I honestly believe very few, if any, engineers working in this field know. And that is *control.*

"Do you realize that in the operation of this machine—television—we must split hundreds of seconds of arc in order to follow a moving object even a few miles away?

"I'll go into this in detail, for I see by your puzzled expression you don't understand me. Suppose we attached a beam one thousand miles long, one end of which is pivoted and the other free to swing in a complete circle—a radius-arm in other words to a motor car traveling at a rate of speed enabling it to traverse sixty miles in an hour. How much movement could you expect at the pivot of your projector?"

I dwelled upon this a moment, scratching a little diagram with a match on the wood railing. "Oh," I exclaimed as sudden realization dawned upon me. "Why, it would scarcely revolve at all!"

"Exactly," he declared. Taking his pencil, he placed

a dot on my sketch a short space from the pivot. "Now, suppose you travel along this beam—say a hundred and fifty feet and figure out how much travel there would be at that point?"

I thought it over a few minutes, seeing it was nothing more than a problem of simple proportion, made the necessary changes of units, and figured it out on the back of an envelope. "Nine feet," I told him.

"Yes, nine feet—and at six thousand miles distance your hundred and fifty foot beam would only move eighteen inches in an hour!"

"Now, do you see the reason for the three-hundred foot diameter track? Objects don't move sixty miles an hour all the time, neither do they always travel concentrically with our radius. See that vertical gear quadrant? We must move the projector vertically just as precisely if not more precisely—as we do for the horizontal movements. We have to 'trace' —'motion' no matter which direction it's going or how slow it's going, and the only way to do it with accuracy is to use *immense* means of control. Sometimes we move this one hundred and forty ton assembly so slowly that only an eighth of an inch of the rack is traversed in an hour."

"Couldn't you use the 'floating' system which has been adopted in the big telescopes?" I queried.

"Could—yes. But why go to the trouble of balancing that awkward projector when this system is a whole lot simpler?"

For a time I stood regarding the details of the construction while thoughts raced. So that was it! The truss was geared to the rack and formed the long lever turning the projector whose 'face' would be under such perfect control that very little trouble would be felt when following a distant object. What! Why those scatter-brained writers! The nerve, the audacity, and the ignorance of those fools in supposing they could expect to see things with a device no bigger than an ordinary searchlight and mounted in the same identical manner. Why, it was plainly evident, here was the biggest handicap to successful television in the entire mechanical design! And how spectacular and vivid a description could be put into words if some competent technical writer saw this projector as it stood on Television Hill!

Wentworth was speaking, breaking the train of my thoughts: "So, you see, McManus, the problems in television were not so much electrical as they were mechanical. When you begin to learn of how some of our equipment has been carried to the superlative peak of mechanical ingenuity by the clear-thinking of our engineers, you will see to what degree of preciseness the human brain can conquer a supposedly impossible task. I know you will be driven almost to the wall of despair in your effort to find adequate words with which to picture your impressions, but, if you pass the next year here and do not change your opinion of man's limitations—well, I'd say you were not human" He laughed.

"I'd like to take you up that ladder to the projector now, but we won't have time. We have planned to run a working test tonight—the first since June, and I have to make a run around to the other two transmitters to make sure all is in readiness."

I was in such a mental muddle, trying to connect all the things I had seen and heard, attempting to put them in order so as to form some sort of a theory of how television was accomplished, that I paid no attention to where Wentworth drove after we had left the hill. He pulled to a sudden stop on a concrete drive skirting a steel building bearing the unmistakable markings of an airplane hangar. We were at the river's edge and the hangar faced the water, while back of us rose the sharp slopes of the tree-covered banks. A short distance to the south could be seen the white sides and red roofs of the workmen's homes Wentworth had spoken of last night.

An explosion of sharp detonations cut off an explanation Wentworth was about to make. With a humorous shrug, he motioned me to follow as he entered the side door.

It was a conventional aviation structure in every respect. Two standard cabin monoplanes, of metal construction, and equipped with pontoons were quartered in one corner, wings folded back, while on the concrete ramp leading into the river water, was a huge orange painted Sikorsky amphibian, its two motors bellowing a chest-throbbing roar.

A mechanic stepped up to Wentworth and I heard his shouted words: "We just started to warm up—be ready in a few minutes."

Speech was impossible in the thunder amplified by the steel walls of the hangar. After a time Wentworth tapped my shoulder, pointing to a portable stairway swung out of the overhead hatchway of the plane. Once inside he went forward into the pilot's compartment and after a mouth-to-ear conversation with the pilot, returned and seated himself in the chair ahead of me.

In my position I could see over the right stub wing and look up at the vibrating motor. The men were motioned away, the motors roared anew, a blue trail of smoke flooding from the exhaust pipe. Easily we rolled down the ramp and settled in the river. A metallic thud announced the withdrawal of the landing wheels into their stream-lined compartments and, heading into the south wind, the unleashed Wasps took up their deep-throated, reverberating song of power in earnest—the flame-tipped blue exhaust gas streaking rearward into the swirling ripples raised by the air-stream. The cabin floor tilted up slightly as we began to plane over the surface, the hull vibrating under the pull of the motors until the windows rattled in their frames. Rising in a spreading white feather on both sides of the cabin, drenching the motors in a mist torn to flying shreds by the spinning discs of the propellers, was the spray. Suddenly the veil of spray receded and was gone. We were flying! The water was dropping away from us in annoying and slightly unpleasant jerks. The booming "motor-music" of the Wasps grew deeper and steadier as we seemingly moved slower and slower along the river course, until the plane itself seemed rigidly fixed in the skies, while the earth drifted past like some mighty curtain. I confess flying was a new sensation to me, and I gloried in every new discovery, thoroughly disgusted with myself for ever backing out of the many chances I had had.

The trees, I would have sworn, were tiny masses of sponge hugging the surface, and of their height nothing could be judged except for the dark shadows they cast. The countryside, wonderfully beautiful in a crazy quilt of horizontal, vertical, and diagonal lines of every imaginable color, was a sight so strange and unearthly that the eye was held in rapt attention. From the air the world is beautiful!

Farm houses and their attendant buildings were minia-

ture replicas of model-like unrealism. Incredulous it was that men and women lived and worked in them!

Away to the south was the tiny village, Dixon, a silver thread snaking through and out past it.

The plane tilted suddenly, cutting off my view of the ground and throwing the cabin in shadow as the sunlight shifted from the left windows around the front of the ship and swung to the roof of the cabin on my side. Leveling out, the plane began to retrace our aerial path over the river, now a curving polished streak apparently no wider than eight inches.

Below the right motor I saw a bird's eye view of Television Hill. The projector, with its circular track, was at this height a monster clock whose hands pointed due south. A tiny toy block with a stub pencil standing close by, almost hidden in the trees, was the powerhouse, while a longer building on the southern slope of the hill, and about a thousand feet to the east of the cottage was the projection-house, for atop it were the two water towers Wentworth had drawn my attention to last night. Almost below us, now, were the homes of the workmen.

Wentworth pointed out a power-line-tower system stretching far into the north. They began directly at the powerhouse.

"Ours," he shouted. "They go up to the Wisconsin line—then split. One branch goes to New Glarus and the other to Lake Geneva. A forty-five thousand volt system. The towers carry all of our lines—power, phone, control, and so on."

Near Oregon, Illinois, the towers lined toward the north and we left them, bearing toward Rockford, over which we soon passed, folowing the Rock River to Beloit. From there it was a cross-country flight until the deep blue depths of Lake Geneva appeared. A wide, booming circle over the town and we headed toward the surface, dropping swiftly. I watched a bug of an ambitious speedboat make a humorous attempt to keep up with us. The far-carrying beat note of the skipping launch became audible as the Wasp went idle, and I sensed, all the more, the slipping, uneven, and uncomfortable slide downward. There was a century long moment as we poised a few feet above the water—a slither of spray wetting the stub wings—a hollow rebound—a heavier splash, and we were skimming over the surface, the thundering motors pulling us toward a concrete ramp similar to the one we had left on the Rock River. The wheels were shipped and we emerged upon the landing.

"WELL, how did you like the ride?" asked Wentworth as he hurried me up a narrow stairway.

"How else can one describe his first air flight than to say—Wonderful!"

At that he turned with a rare and perplexing smile on his lips. "Wonderful? That is all you have been muttering since you came here! But, you haven't seen anything yet! Wait until tonight and we'll see what other descriptive adjectives you can muster."

"THIS projector is back in the country quite a bit and rather inaccessible to a plane; so we'll have to motor there. This shore property once belonged to my Dad. I'm sorry to say I've been forced to parcel it out to real-estate sharks to keep Television Hill going." At a garage we found a small sedan with waiting chauffeur. He took us down the highway a bit to a deserted and little traveled dirt road circling about through the tiny ravines and steep hills famous to this region. The trees were thick on all sides and frequently we passed glaring signs warning against trespassing on this private ground. We climbed a steep grade and near the top we were halted by a wire fence of the type I had made such startling acquaintance with at Television Hill.

Several cottages and the brick structure housing the transformer group were the only constructions inside the barrier. The driver played his horn and the gates opened in that mysterious manner by electric control.

At the cottage we were met by John Somerset, the manager of the station, and his daughter Eloise. Wentworth, as soon as introductions were over, started right in with an incomprehensible discussion in which figured many code numbers and shop terms of such a highly technical nature that I gave up the attempt to follow them and retreated to the porch, smoking and looking at the fantastic bulk of the projector. What must those astonished persons think who happened to get a glimpse of that monster affair spread out over the hill-top? It was plainly visible for miles in any direction from the surrounding hills and surely some one at some time must have become curious enough to make inquiries about it. Whatever King and Wentworth told these curious ones must have been satisfactory for I had never heard a single rumor of a television apparatus being built in the country, much less in my own home State!

On the far end of the porch was a hooded searchlight and near it—a steel tripod. Yes, a machine gun rest!

The girl came to the door and smiled as I nodded. "Were you looking at our 'defenses'?" she asked.

I admitted I had been doing so, somewhat perturbed by her frank scrutiny of my person.

"Those are more for effect than for anything else," she confided, closing the screen door and seating herself on the porch step. "Do you see that little triangular house perched high on the right tower?"

At the Television Hill projector I had first noticed this tiny building set atop the tower and had wondered about it, seeing that the only means of access was to climb up the sixty-foot vertical ladder fastened to the tripod.

"In there a man is always on watch—day and night. He's got half a dozen machine guns in his armored 'castle' and those searchlights hung from the tower platforms can make the hill as bright as day. During the next hour I learned much about Television Hill and its people from the well-informed Eloise, whose knowledge of the mechanical side of the plant was amazing. She and I were well on the way to being good friends when Wentworth appeared.

"Ready, Eloise?" asked her father.

Wentworth explained. "She's coming back with us to Television Hill. King is bringing his daughter, Diane, with him. The girls were great school chums; so they'll be all-up-in-the-air to see each other again."

"Yes, Diane must have much to tell, having been in Europe for the last five years," admitted Somerset, lighting his cigarette. "But, say, Bob, you didn't make much of the report Smythe has made concerning his difficulty in getting New Glarus and my station to line up at one point southwards?"

"Oh, that," drawled Wentworth frowning, "don't worry about that little thing. There's no reason for it

and I'll speak to Williams about it this afternoon while I'm there."

Then Eloise appeared with several suitcases and hatboxes.

"Hey, you," ejaculated her father. "Where do you think you're going with that truck?"

Eloise flashed him a hurt and surprised glance. "Why, this is only what I need!"

SOMERSET'S hearty laughter rang in my ears long after we had returned to the amphibian and were roaring westward. With an elbow resting on the window sill I watched the slow march of the countryside below the stub-wing. The sharp, vibrant hum of the Wasp and its supporting spars and wing seemed indescribably fixed in the mid-air while the whole world rose and fell far below us. It was nearing noon, I knew, from the fleeting shadow darting at terrific speed over the farms and the feeling of hunger in my midriff. Eloise and Wentworth set on the sunny side of the ship; the girl watching the scenery and Wentworth reading a handful of letters he had pulled from his pockets. I was glad when I discovered the third and last projector some three miles northwest of New Glarus, Wisconsin.

A sudden unexpected, alarming clank and thud announced the extension of the landing wheels and the motors went silent as we slid toward a flat field close to the sharp rise of the considerable height on which stood the projector.

Wentworth drew me aside as we left the plane. "Listen, Mac, don't feel hurt, but the work I have to do here will take four or five hours, and is of such a nature that your presence would be—— Oh, well, you get the drift of what I hate to say."

I nodded, understandingly.

"So you and Eloise will have to entertain one another; I'll get you a car if you wish."

When told, the black-eyed Eloise was delighted. I was disappointed, for I saw Wentworth was not yet ready to take me into his confidence by permitting me to see the interior of the projectors. I took the limousine and drove to Madison where the girl and I dined and later watched a dull motion picture and an even duller news-reel. I couldn't get my mind off the greater appeal of the work Wentworth might be doing, and heartily wished myself at his side. This was no reflection on the girl's companionship, however.

AT five-thirty I pulled the car up to the cottage at the New Glarus station and found Wentworth awaiting us. He greeted us, "All set? Now we'll fly home and have dinner at seven with the Kings."

Once more in the air, we were droning southeast. Now, my impressions were more sedate and reasonable as the shock of discovery was wearing off. The more I dwelt upon the immensity of the work King and Wentworth had accomplished, the greater grew my admiration. They had something more than a mere laboratory experiment: why else this elaborate display of extensive equipment; the power-lines, the powerhouse; the three projectors in two states, the number of men (almost two hundred throughout the entire plant), the many cars and trucks, and lastly, but not least, the hangarful of fast planes? If this were the *real* thing, just what must the rest of the world-known engineers be working on—a lot of pitiful trash?

Television, as Wentworth claimed it to be, must be a marvelous thing—almost beyond imagination in its mechanical wonders. No wonder then, that stories written around and about this apparatus were always so indefinite and misty about the engineering problems met with by the inventors! No wonder authors thought best to keep silent about these interesting points, passing up their own inability to picturize their imaginary instruments by claiming deep secrecy of the inventors and the ignorance of the teller of the story!

The part I was to play in this realistic, life and blood story was beginning. And what a beginning! Just what responsibilities would be thrust upon my shoulders I did not know, but, whatever they were, I hoped they would not put too much demand upon the lines I knew so little of. Still, within the year, when my contract would expire, I would know whether or not I had been of any service to the company. If Wentworth and King would be willing to bother with me further, it would be utter foolishness on my part to leave—especially as there was so much opportunity in this field for future development. However, a year is a long interval of time when it is just beginning and of the many unthought of things that can happen in a year, God only knows.

It wasn't long before we were circling above Television Hill. We slipped sedately down between the banks to the river and surfaced close to the hangar.

"KING in yet?" asked Wentworth of a mechanic, after a glance about the hangar. The pilot tossed Eloise's baggage to me as I stood beside the dripping hull of the Sikorsky.

"No, sir. There was an accident at the field—a collision between a tri-motor and a smaller ship taking off. A bad mess, so phoned Mr. King."

Therefore we took our way up to the cottage on foot, Wentworth launching into a disgusted series of remarks concerning the danger of the Municipal Airport as a landing field for commercial and student planes.

After removing the traces of the day's jaunt, I returned to the veranda where I found Wentworth smoking his pipe. He said nothing but sat in a listening attitude, his eyes focussed to the east.

At exactly six-forty-five there became audible a distant hum. It wasn't from a motor-car speeding on the highway across the river, for it rapidly increased in volume to the crescendo whine of a wide-open plane motor and a moment later, leaping swiftly from the darkening eastern skies, a Lockheed Vega amphibian flashed its black-trimmed orange fuselage over the cottage with a terrific, ear-splitting, blatant snarling, and heading toward the river, banked sharply, dipping directly below the tree line.

Thereupon its roar ceased.

Amazed at the speed in which the plane had come and gone, I stood with craning neck staring incredulously.

Wentworth came to my side, grinning.

"Know who was piloting that ship?"

"Couldn't guess. Might be Lindbergh or Al Williams."

"No such luck. Just our friend, King. I know when he is at the stick. Crazy for speed, he doesn't waste a single move. Takes off and immediately starts in the direction of his destination, gaining altitude as he goes. Although he's over fifty-five years (young) he can fly a lot harder and cleaner than the regular pilot, who accompanies him at all times."

A FEW minutes later a small green truck poked its stainless steel nose up the drive and the machine came to a skidding stop before the stairs. A helmeted man of average height and of slightly heavier than normal build clambered out of the right seat and assisted a girl to alight. The mechanic-driver reached into the rear compartment and handed out a collection of various sized suitcases and handbags. The older man, who I supposed was King, began to get a handful of suitcases together, but Wentworth and I were upon him instantly, relieving him of his burdens, despite the humorous scowl he gave us. There was joyous, shrill greeting as Eloise dashed from the veranda into the arms of the newcomer. Then the house-servants came running and for a few minutes I stood, my arms full of bags, totally forgotten in the handshaking and chatter. Once there was an interruption as the mechanic dropped a bulky trunk on the porch floor. After a semblance of the usual quiet had been restored, King became aware of my presence.

"Why, hello, McManus! When did you get here? Yesterday afternoon?"

I nodded, absently, I confess, for my eyes were directed toward the girl. I turned to him, recognizing him instantly, now that he had withdrawn the helmet. His white hair was combed in an attempt to conceal the thinning spot on his crown. Undoubtedly he was not totally immersed in his great work, for his general appearance was neat and well-groomed almost to the point of fastidiousness. His brown eyes twinkled. The clear pink of his skin spoke of a rigorous and well-balanced life.

I had seen him many a time in the main offices of the New Era Film Company, and once, without his identity having been mentioned, had answered some very perplexing problems he had presented to my chief, who had referred him to me.

My eyes returned to the girl. King followed my gaze, a slow smile of understanding breaking over his lips. He motioned for her to come over.

"Diane, this is the man I've been telling you about. Mr. Thomas McManus, whom we took from a responsible position at New Era."

I don't know what happened to my tongue, but my agitated brain could not connect with the words I wanted to say; so I just nodded, stammering. "Pleased to meet you."

Her smile was disarming.

"I think he'll come to like our place a whole lot better than New Era, Dad." She laughed merrily. Eloise then took her into the cottage.

Wentworth was regarding me pensively through narrowed, humorous eyes.

"Oh, ho," he chuckled, winking to King.

I certainly felt foolish when I discovered that unconsciously I had been holding the suitcase during that interval!

WENTWORTH, humanely, changed the subject. "Well, King, how did everything go?" He eased himself into the swing while I relieved myself of the bags by turning them over to a servant.

"Fine, Bob." King settled on the wide rail. "Everything went OK. Had a little trouble from Elliott at New Era, when it came to agreeing that he keep the sources of his films a secret. They will take care of the distributing and furnish us with all leads, swinging in a set of tickers, teletype machines hooked with AP, and radio communications at such times as necessary."

"We will train our own men and women to handle our ends of the lines, instead of importing doubtful help as we had intended doing at first.

"We are to produce a negative and one positive film, and, according to the terms of the contract he and I drew up, we must have both reels at the Municipal airport three hours after the news breaks."

HERE he paused, turning to me.

"That means, McManus, you will have to swing directly into your work and get your cameras running within the next two months. We have already ordered the equipment we thought necessary and whatever more you need will be put at your disposal immediately."

"How do you like Television Hill? Wentworth show you about yet?"

"Yes, sir. He had me on the move quite a bit today. Gave me my first air ride up to the other two stations and showed me around here. And as to my liking the place—words fail me in conveying the pleasure and joy I have experienced since yesterday."

Wentworth grinned. "He's seen a lot of what he expresses as 'wonderful,' and I don't blame him for wanting to stay." He regarded the bowl of his pipe with an assumed attentive stare.

"Where are we bunking him—in the village?"

"That I haven't decided yet," thoughtfully replied Wentworth. "I had him here last night, awaiting your decision."

"The cottage is plenty big enough, so why not keep his room for him here? We can keep our eyes on him the better," King laughed wholeheartedly, giving me a reassuring wink. I had yet to learn of the keen powers of observation he possessed. A wizard in the chemical and mechanical sciences, he could ascertain with uncanny accuracy the actions and character of those with whom he came in contact. Though I could not even suspect it, he knew more about me and my past history at the time, than even my closest friends.

"Tonight's the big night, eh?" remarked King suddenly.

"Yes, tonight we run the first of a series of tests to see how the increased power will affect the screening. Our useful range ought to be about five thousand miles, now that we've stepped up the beam range to cut entirely through eight thousand miles. Williams and I went over the entire projector assembly at New Glarus and still we didn't find the reason for the queer skip when the projector is in motion. Still whatever it is, it must be extremely minute at the transmitter, when it only becomes apparent at a radius of two thousand miles. And, the funny thing about it, King, is that we have that trouble at only one spot on the compass! Matter of fact, it's beyond me and the rest of the men at New Glarus and Lake Geneva. Somerset was telling me today that he caught several curious people sneaking around the fences during the last weeks. He had one of them arrested and the news printed in the local paper there; so he thinks he'll not be troubled any more."

I HAVE often attended dinners, banquets, and affairs of like pleasantries, but supper that evening was one of the most enjoyable hours I have ever experienced.

No mention of shop was made and the two older men joked and told humorous experiences throughout the entire period. King had a rich store of humorous anecdotes which he related in such a manner that we were convulsed with laughter.

"Back when Diane was a little, curly-headed imp just knee-high to her lanky Grand-daddy, with whom we lived in Evanston, we had a big, raw-boned negro boy chauffeur. And a fine one he was too. He had a meddlesome little brother, Ambrose, who hung about the place quite a bit, running errands and doing other light jobs. One cold April morning Bill was working on the engine of the limousine, testing plugs or points. He had the motor idling and as I stood waiting for him to finish his job, he called, "Hey, you, Amby, quit yo' makin' all dat racket wit dose skates and git me some watah in dis radiator.' Ambrose skated over to the water faucet and filled the pail to the brim. He skidded and slipped as he tried to retain his balance while pouring the water into the awkward height of the opening. The water slopped over the shell and down into the fan, where the revolving blades threw it into Bill's face."

"Startled, he jerked his head out of the way, shouting: 'Hey you rascal, don't do dat. I jest shined her up!' The screw-driver he held slipped off a plug, shorting the high tension juice into the frame of the car, from which it traveled up the descending stream of water into the pail, through Ambrose's arms and body, grounding through the skates on the wet floor. Poor Ambrose let out a terrified screech and his contracted muscles tossed the half-filled pail almost to the ceiling. He and the overturned pail both hit the floor at the same time and the same place! Looking more like a drenched rat than a human, he clambered to his feet and tore out of the garage as though a demon horde were at his skates. Never again would he put water in a car while the motor was running."

THROUGH many episodes like this my eyes had invariably strayed to Diane who sat directly opposite me. Several times I apprehended her quick glances in my direction. Once Eloise caught my attention. A meaning nod of her head and a slow wink revealed that she had become aware of my actions.

I could scarcely come to believe we were the principals brought together from the various walks of life by the amazing experiment of television. As usual, I began to draw my comparisons with the tales told in fiction, as they would have been depicted in accord with the established canons which those specialized authors seemed to hold to rigidly. King and Wentworth could have been excused if they were found to be one-tracked, super-intelligent, thin-lipped theorem-issuing, physical monstrosities whose predominant thought was the successful completion of their self-appointed tasks, to the utter disregard of all else. I thanked the Lord that life was different—that we found a safety-valve in laughing at the misfortunes of others, concealing, as it were, our compassion and sympathy.

King and Wentworth, despite the knowledge of all their stupendous accomplishments, were as natural as the average business man, jeering good-naturedly at the absurdities of the impetuous words and actions of those around them.

Come to think of it, it wouldn't be a bad idea to write a story, or at least a diary, around the experiences here. Surely they would be more amazing and a lot more thrilling than any of those imaginative tales I had read. A year from today I could look back upon these impressions and, perhaps, laugh at them. Then, too, I could work in the entry of Diane in a pleasant little plot. And when King decided to expose his work to the world I would be in position to "scoop" the world of fiction with the *real story!* I would try it! Though unversed in story writing I would hold the indisputable advantage of actually living my incidents!

So ran my thoughts as we left the dining room and repaired to the veranda. King and Wentworth smoked and commented on the day's news. Then as the moon rose they took leave and strode slowly down the path, heading toward the projector house. I sat comfortably alone in one corner of the porch thinking over the highlights of the day, and wondering quite a bit about Diane, I had to smile when I recalled the sight I must have been when she was introduced to me and I stood speechless and gripping those bags.

"MR. McMANUS." It was Eloise's voice. "Come here, quickly."

I arose and hurried along the west side of the veranda to the extreme north end, where I found the two girls staring uphill toward the unseen projector.

"Look," she directed, pointing to the west and the river. "The projector is in action."

I saw it! A deep lavender glow quivering as though generated by some mighty arc sputtering in a gigantic searchlight, covering a restricted area over the west banks of the river, silhouetting the trees in a bold curtain of exotic purple and black. On the still night air came a distant crackling and a heavy monotone of humming.

"It's always like that—until the "tubes" have become warm enough to take the terrific shock of milions of volts of plate potential," explained Eloise as the awful grandeur of color faded away slowly.

On Diane's face was mirrored utter amazement.

"You seem quite moved, Miss King," I exclaimed.

"You, too, appear to be slightly wrought up," she returned quickly, seating herself on the wide rail the better to watch flickering spurts of red and violet light flashing over the countryside to the horizon in streaks of horizontal lightning. No wonder a powerhouse was required to feed the projectors!

A phone burred within the hall and Eloise skipped away to answer it.

After a moment Diane took her eyes from the beams and looked at me. She said, "Don't you think my Dad a wonderful man to have brought this wonder to the world?"

I adjusted my glasses with an assumed nonchalant gesture.

"Well, taking things as I've seen them today, your Dad has accomplished some very wonderful things during his whole life."

Eloise ran up then. "Mr. King is down at the projection house and he wants us to come down there, too."

IN daylight the projection house was an unusually plain three-storied structure surmounted by the distinguishing water towers, but in the moonlight, the seven hundred foot building loomed a huge, mysterious block fading into the trees, its square faces broken by the glittering reflections of the moon on its many windows.

At the open door stood King awaiting us.

"Tickets, please," he smiled leading us through several

small rooms fitted out as offices and drafting rooms. He pressed a button on the brick wall in the last room and the heavy fire door was rolled open by an attendant.

We were on the threshold of an unusually plain and business-like theatre some three hundred feet deep. At the far end, almost covering the entire width of the building—approximately sixty feet, and rising thirty feet high above the stage floor was the cyclopean screen! From the manner in which the dome lights were reflected from its surface I was put in doubt as to whether or not it was made up of some curious glass, strangely opaque and yet transparent. It had the defying appearance of being there and not being there!

The floor had the conventional theatre slope, but there were only about a hundred seats grouped near the center. In the rear jutted a balcony. Packing crates and a lot of bulky mechanism littered the entire platform, for such it was, having a level floor instead of the slope generally found. Occupying a position directly below the forward edge of the balcony was a shoulder high circular construction some thirty-five feet in diameter. Above it, suspended from a steel structure, was a great mirror. Filled with wonder and conjecture I took all this in, deciding the projecting mechanism was on the balcony as in the modern theatre.

King led us directly to the last row of seats and left with an apology. I watched him run up the side stairway to the balcony, where Wentworth and several other men were busily engaged in their work. As a pleasant surprise an organ began toning out a vibrant, colorful, futuristic selection.

Slowly the lights faded out and the screen glowed with a steady white light.

It became alive with a whirling, black-lining, streaking, formless display of whites and blacks, reds and blues, the like of which I have never witnessed. It affected the eyes in a curious manner, almost causing one to believe he were sinking into the coma induced by ether. As the dizzying spectacle continued, the organ, apparently frightened, went silent. King's disgusted exclamation cut through the air like an explosion. I closed my eyes momentarily .

A gasp from Diane caused me to open them quickly only to stare in open-mouthed astonishment upon a country scene pictured on the monster screen with such tantalizing depth and definition that I could have sworn we were looking upon the actual scene itself under the reddish glow of some inexpressibly powerful searchlight. The fact that only objects of an apparent distance of a hundred feet deep were shown made it appear the more to be a stage set.

Wentworth's voice cut through the silence. "That scene is from a farm forty miles west of Davenport, Iowa. Now, watch closely—we're going to do a little traveling tonight."

Slowly the scene flowed toward us, coming as though from a distant mist, taking clear definition in close proximity, and fading seemingly at our very feet. Faster it moved, trees and houses dashing toward us as we leaped over the countryside, cutting with a sudden flash here and there through farmhouses, delving into the sudden blackness of the hills and emerging into light as the invisible rays carried us onward.

At length my sorely tried patience gave way and I left the girls and sought the stairway to the balcony. As I threaded my way between the various boxes and other obstructions, I came to the most disappointing discovery I had yet made. I don't know what sort of machines I had expected to find up there, but I had judged them to compare with the rest of the monster equipment.

King and Wentworth stood beside two men seated before the lengthy console. As I came into the area slightly illuminated by shaded lamps, both of them nodded in welcome. One operator sat in a comfortable chair behind a large steering wheel as you find in an automobile. And like the auto-wheel it had a number of controls clustered at the hub. At his feet were a series of pedals, narrow in width—something like the foot-pedals of the organ. His right foot was pressed on a lever by which he controlled the speed of the motion forward. On his left were many hand-wheels which he adjusted from time to time, making alterations with the larger wheel slowly. Studying it for a time I saw that the steering wheel caused the scene to shift to the right or left, while the larger of the handwheels caused the scene to tip up or down.

His vision of the screen was unobstructed save for two red converging lines shining brightly on the mirror surface set so that the lower edge just came even with the top edge of the screen. Right in front of him, in a position similar to that of the dash-board of an automobile, was a series of meters and dials. Some were spinning rapidly while those that moved slowly could be seen to be calibrated in such units as feet, miles, and hundreds of miles. One was a speedometer which then registered three hundred miles an hour on a scale running up to two thousand miles!

Was it any wonder objects were dashing up to the screen so swiftly that they were indistinct and blurred?

Below this meter was the usual total-meter and beside it the trip meter. On the latter the tenth mile figure returned to zero every twelve seconds!

The operator on the left side watched the screen with intent stare, his restless fingers playing over the five banked series of toggle switches continually in response to the flashing lights of a hundred or more tiny red lamps.

Wentworth turned to King. "We've got to eliminate that "mixing panel." It's only a makeshift at best. I've got Smythe working on an idea of an automatic device that'll catch those little discrepancies in synchronizing and lighting, and right them instantly at their sources."

Here I touched Wentworth's arm.

"Say, how come? It's night, yet the images on the screen appear as clear as though they were under a powerful light."

He flashed an amused smile to King.

"McManus, sunlight or moonlight are not necessary to the searching eyes of television! Now, please, do not ask me to explain, for it would take me all evening to do so, and I doubt if you'd understand. But don't worry, you'll find out yet. Take in the show now."

SOMEWHAT rebuffed, I sought my former seat beside Diane who greeted me brightly. "You disappeared so suddenly I thought you had become frightened. Isn't this too wonderful for words! Just think, we are looking upon sights hundreds of miles from here! How is it done?"

"I'd be much pleased to tell you, Miss King, but you see I know almost nothing about it from a technical and exact standpoint." I had to admit that.

"Jim, my brother, has been telling me in his letters

what Dad and Mr. Wentworth have been doing during the time I have been away from home. Before I went to Europe I did not pay much attention to the things going on around here, living as I did with relatives in Chicago. Now, I begin to see some of the marvels they have accomplished."

The expansive screen was alive with a quick changing of scenery as the penetrating eyes of television leaped across the country at amazing speeds. As we sat in those comfortable chairs, there passed startling and revealing views of Omaha, Denver, Salt Lake City, Oakland, San Francisco. Of the hundreds of intermediate towns and villages very little could be distinguished, so great was our speed of passage!

We paused in San Francisco to sweep up and down the main streets to test the equipment under the varying speed conditions met with in motorcars and pedestrians. As one would suspect it was a thrilling and withal an alarming sight to see the steering wheel and dash-board of a machine on the screen, while the far-distant hands of the driver guided his way through traffic, unaware for a single moment that over eighteen hundred or more miles away eight people were watching his every move! We paused once off the Golden Gate to take a look at an Orient-bound freighter. Then up the western coast we raced. Raced is a much-used term for our present day velocities, but I could not think of a more descriptive verb to portray the pace at which the televise rays cut radially as we swept to the north. Starting at a speed of three hundred miles an hour, the operator slowly accelerated the motion until the screen was one continuous stream of horizontal lines. Then he announced. "Three thousand miles an hour!"

The flight from California to Portland, Oregon, was made before we were aware such a distance had been traversed. At Seattle we roved over the sailor-crowded decks of the fleet anchored there. And we saw what the power-plants of these mighty sea-fighters looked like, when King sent the closely focused penetrating rays into the very hearts of the ships. It was actually X-raying ships in a land where it was just beginning to take on the darkness of evening and was such an unthought of feat as to be almost incredible! But to see such a thing taking place before my own eyes! What could I say?

Diane gave her impression in one short expressive exclamation, "Impossible, but true!"

From there we raced even further up the coast. Almost into the Aleutian Island area. Then, retreating now, we swung back through northern Canada, passing Hudson Bay, dropping down through Wisconsin until there was pictured a view of the idle projector at Lake Geneva.

What happened then was one of the most unusual stunts ever attempted, either in actual life or in the world of fiction. A moment of darkness flashed over the screen followed by the blacklining and whirlings. To my surprise I found we were looking upon a scene on the Rock River near Rockford. Following the river, the screen moved along the river road toward the south and in our direction. I almost imagined we were driving over Route No. 2 (The Rock River Road) at a pace close to sixty miles an hour. The machines we passed flowed through the screen slowly with evidence of slight cross-sectioning when they were going in our direction and were just a flash when they came from the opposite way. We came to the place where the road turned into a private lane leading to the bridge crossing the river to Television Hill. It is impossible to express the emotions I felt as the scene went from the guard-house, where the watchman sat, rifle close by, watching the approach of the bridge, across the bridge to the other guard-house, up the path, and past the cottage toward the projection house. Honestly, my heart was pounding with excitement by the time it was creeping up through the outer rooms and approaching the steel door. Then, breaking through, it screened the theatre lengthways, then the balcony, and crept up to the control system. King waved to his double on the screen. Wentworth laughed his amusement.

"So that's how I look to you people," he said loud enough for us to hear.

The next moment I was in the center of the picture. I arose and stepped into the aisle, drawing Diane after me.

"See," I explained. "You have to face the north if you want to see your face on the screen."

The two girls went into pealing laughter as they saw their actions portrayed instantaneously on the screen, though we were in apparent darkness. Apparent I say, for I sensed rather than saw a faint violet glow throughout the entire theatre. Then, too, my skin felt as though high tension current were flowing over it. Whatever the reason, it wasn't unpleasant.

With that as the climax, the screen went dark as the dome lights flashed on—and the first television performance of the world was over!

Television, now, was a reality! Stark proof had been presented in a manner that silenced all doubts I had held. The bands of interference caused by physical, mechanical, and other natural conditions clearly demonstrated that 'faking' could not have been carried to such extreme care. And seeing myself on the screen had satisfied any questions I might have asked!

There in the space of four short hours we had covered a trip throughout the west that ordinarily would have taken months for the average traveler to traverse. He would see less than we did and would have to undergo the discomforts of long and tedious journeys by rail and motor; would have the concurrent expense of his lengthy trip in lodging and food; and wouldn't be beset at every stop by worry of connections and tickets. We, seated in those comfortable theatre chairs, had looked upon the passage of over sixty-seven hundred miles of the country in less than four hours!

TELEVISION!

It had come!

THE days passed quickly as they always do when our time and minds are completely taken up with work which draws every bit of our interest and capacity. The specially designed and built wide-angle cameras were installed on their fixed stands on the balcony front and their shutter-synchronizing devices, necessary for reasons at once apparent to a projection expert, hooked up with the driving shutter mechanism of the television screen projector. The film, Fotophone and Movietone width, was fed into the intake reels by automatic "reelers"; thus enabling a continuous movement of film through the cameras without a halt being made to reset new stock during a "valuable" shot.

The exposed film, with recorded "sound," either produced by an expert group of "sound-artists" who had been trained to duplicate every and any sound met with in the usual run of news "stuff," or added later from an ever-growing library of phonograph records, was led

through a light-proof chute directly down to the basement, where the conventional methods of developing and printing were carried through.

A few hitches were met and conquered in quick order by whole-hearted concentration of efforts on the part of all the various departments involved. Witnessing this, I saw why so much progress had been made; everyone was so intensely interested in producing his best that coöperation came as second nature.

Towards the end of my allotted two months I began to shoot scenes in and about the vicinity of Chicago to make sure the extremely complicated apparatus I had built up was functioning perfectly. As may work became more and more advisory, I had plenty of opportunity to watch the entire television machine in operation—at least, those parts that were in the projection theatre.

King and Wentworth did not make any attempt to inform me of the processes and theories on which their vast machine was based, other than to speak pointedly on those mechanical features closely connected with the "camera-bank."

OUR testing went on. Late one October afternoon there came a sudden clicking of the Teletype machine installed near the control console and I hurried back, hoping it would be something we could film.

"NEW ERA FILMS," pounded out the flying levers, 5:30 P.M. SUNSET SPECIAL, UNION PACIFIC FLYER, DERAILED NEAR FREMONT, NEB. WEST OF OMAHA 30 MILES."

At my call King came on the run, took a look at the typed sheet and shouted to all, "All right, boys, get set. This will be the first shot we take."

With swift precision the lights were switched out, and the screen, after its usual period of aimless whirlings of black and white, was synchronized in relation with the companion transmitter at New Glarus, on a scene somewhere out west. The two operators were adjusting their instruments with great speed. Glancing upwards toward the overhead mirror I watched the slowly moving red lines reflected there from the circular structure on the main floor.

I hurried to the rail, joining King and Wentworth as they peered into the thirty-five foot opening almost below. At first I had mistaken this for some part of the machine used in the projection of the screen images, but, after seeing it in operation once, I had been overcome with appreciative regard for Wentworth's amazing mechanical skill.

It was a deep set, faintly illuminated map of the world! A map so curiously contorted and grotesque that I had spent some time figuring out the contours of the land divisions detailed. With a spot near the lower western edge of Lake Michigan as a center, the map had been laid out in such a manner that the western hemisphere was depicted in its entirety while the eastern hemisphere was drawn out in such a squat contour that it occupied most of the upper edge of the map. Africa appeared as large as North and South America combined. At length I had to call on King to explain the thing to me.

"You understand, McManus," he had said. "We have to use two transmitters to properly 'see' an object. And that we have to 'tune' both of these projectors on the object by intersecting the televise beams on it. Can you imagine the time it would take if we were to set about to find our object by roving with the screen itself? If we wish to see something a thousand miles away, wouldn't it be simpler to set the projectors to intersect at a thousand mile distance and from there locate?"

"Yes," I had admitted, adding, "that's simple, just figure out the mileage to any city and using it with your other instruments, you would 'land' right on it by pointing in the compass direction from here."

"As easy as that?" He had laughed. "Oh, no! Remember, McManus, you're dealing with something entirely different than a train or an airplane, or even radio! You're reckoning with a beam, a rod of electricity, putting it that way, cutting *deeper* into the earth's curvature every mile you travel away from here! San Francisco may be two thousand miles away from here figured over the earth's surface, but you can see it will be some few miles nearer us when figured in a beam line.

"By the way, McManus, didn't you notice anything queer about the pictures of the west coast that first night you were here? Didn't the buildings and the people appear to lean slightly to the upper rear of the screen?"

I shook my head negatively. Maybe I had seen it and had passed it up in the excitement. It was possible.

"Well, watch closely the next time we travel that far and you'll see it. It's a natural condition and the further we travel away, the more noticeable this leaning backward becomes, until directly opposite us on the globe, we will be looking up through the feet of the people. However, that's a minor detail. What I wanted you to see was this: we have to use a more accurate scheme of sighting our projectors than mere 'findings.' To Wentworth we are indebted for the system we are now using. That system called for the making of a new type of map. Therefore, we had to hire a man, highly versed in geometry, to figure out the beam-line distance of all the principal cities of the world with the focus—the equilateral triangle of our stations. That done, we began to draw the map you see down there. Of course, it looks queer, those cities you know are far off, appearing closer than on the usual map. It's called an 'equilateral zenithal projection' map, and means that every city is at the exact beam distance, but their respective distance from one another, figured concentrically, is misleading, for the map is laid out radially. You get the idea in a wagon wheel. The spokes are close together at the hub, but as you approach the rim, they separate."

Then, using the map, he had pointed out to me the astounding fact that it was not such a wonderful feat to hold radio communication between Chicago and Manila or Calcutta, for, actually, in a radio-distance, these points were only eight thousand miles apart, for the radio waves, in reaching these cities, did not travel southwest to Manila, as supposed by the average radio fan, but shoot directly north-west by north, over the pole!

Then he continued. "On this map we have placed three small but powerful spotlights sending out beams of deep red light. These spots mimic the larger projectors to which they are geared and synchronized in movement. Thus, by watching these red beams and noting the point of intersection, we can determine just about where the larger projectors are focused."

NOW, the narrow light beams struck straight west, finally settling near Omaha. Several shifting sweeps led us to the railroad station in that city and with the rails as a guide, we set down the right of way at a

furious pace. As though comparing the speeds of aid and of curiosity, we flashed through the length of the swaying wreck-train rushing toward the disaster. At ten miles a minute we beamed along, jogging from side to side of the track, unable to keep to the rail at our unthought of speed. Past Fremont—we slowed to a cautious hundred miles an hour. Suddenly a jumble of cars caused the operators to halt. Even so, we had over-run the wreck. Backing up took a little time on account of readjustment. After the screen had been set up for "long shot projection" (horizonal view in depth of screen increased from the usual apparent hundred feet to several thousand feet) the bank of cameras began humming, as we crept forward along the torn-up right of way. It was a bad derailment; the engine seemed to have been thrown off the way by a spread rail. It had rolled over, plowing on its side down the low embankment, drawing the tender and the following baggage cars after it in its plunge. The Pullmans, impelled by the sixty-mile inertia, slewed forward, piling up and over the baggage cars, scattering to both sides, in an awful pile of shattered and bent steel.

We worked under a disadvantage, for physical conditions and the acute angle of the projectors only allowed shots along the length of the right of way. So we contented ourselves with several shots taken as to appear filmed from a low flying plane and several "stills" of the spectacular scenes of the rescue of the injured. King absolutely would not permit any interior "phantom" views.

Thirty minutes after the screen had closed on this sight, the developed film with its positive was rushed to the river hangar, where one of the speedy Hamiltons was ready to take it to Chicago.

"Talk about getting the news," grinned Wentworth, as we stood watching the roaring plane climb into the air. "This television game has the whole news-reel world scooped."

FROM that day on New Era News-Reel had the rest of the news agencies stumped and guessing. Springing from an obscure film distributing firm, it suddenly had blossomed out as the most powerful contender in the fight for supremacy in the filming of events. Hardly an incident worth covering went by that we did not release through them, over the entire country, startling and thrilling pictures of scenes other companies did not hear of or could not arrive on time to photograph. No one seemed to be able to get the vantage points enjoyed by New Era. Then, too, the realistic sound accompaniment was the source of much conjecture, for everything was as natural as life—and timed to the second. We made "shots" of everything; covering the entire United States and Canada in a range of twenty-five hundred miles radius. Our range was much further, but on account of the tilting of the images due to distance, we shunned going beyond this range for the present.

Fires, forest and factory, were thrown upon the screens of the country in life-like roaring. Once we almost "spilled the beans" when we followed the firemen through a burning lumber mill in South Carolina. Ship leavings and wrecks were natural down to the slightest noise. Some were filmed broadside in storms in the Atlantic. Notables were filmed on the unaware hundreds of miles out at sea. The winter maneuvers of the fleet in the Caribbean were viewed with acclaim by the theatre-goers days before the regular companies had broken all records, including a couple of innocent necks, by plane and rail to distribute theirs. The Los Angeles, on her cruise down to Panama was our much heralded "scoop," as we secured some really worthwhile shots of her cabins in action.

New Era spread the rumor of a new type camera developed by their engineers, and after this had been firmly established, we recklessly began to astound the wondering public with a series of the most daring films ever taken in news history.

We entered passenger planes while in the air; snapped scenes aboard trains steaming across the western plains; trailed automobile drivers around their racing ovals; followed the heels of football players; taking any imaginable "shot" the camera and our equipment was capable of registering.

Conventions, gatherings, and speeches in governmental chambers were "scooped" by having a photographer and sound equipment on hand. The camera was a blind while the sound devices only consisted of an active microphone hooked on the sly to the telephone lines. From the lines which had previously been cleared to Television Hill we recorded the sound upon the film. Often we did the amusing stunt of "stealing" the sound by leading the radio transcription directly to the film, thereby seeing and hearing both from a distance at the same instant! Shades of Garret Smith!

Thanks to a very imaginative writer employed by the New Era for the purpose of covering up any slip we might make, the newspapers were filled with impossible stories of how these revealing pictures were made. These stories were taken for their worth until one discerning group made themselves heard on one point: The New Era Company, though enjoying the best shots, was never apparent on the scenes it so wonderfully reproduced! Nothing could be said in answer to that disturbing and often thought of accusation of intrusion of operators. However, from this time on the New Era films had one of the largest and best equipped group of photographers in the whole game. They began to make a name for themselves, reaping in a golden harvest—and—incidently, so were we!

I often paused to wonder what would happen when the news finally leaked out that these news-reels had been filmed by means of television. Without a doubt there would be a short period of astonished silence during which the publications of the country would recount some of the incidents we had filmed, and would fight each other in presenting first page stories painting the possibilities of television in every light and color. There would then be a deluge of half-expressed questions, which, when answered, would bring solemn thought—and then! Swiftly a rising tide of sudden consternation, of alarm, of fear, and of suspicion from all walks of life—from the whole world!

Television, as I now knew it to be, was a powerful weapon, with more grim possibilities than I had ever before expected it to hold. When the day's work had been done and I retired to the privacy of my own rooms to read or rest, the thoughts besetting my consciousness alarmed and frightened me—at times to the point of frenzy. It's all right to think of television as a novelty; as an experiment with untold promise; as the thrilling revealing mechanism of a story told in fiction; as a dream to look forward to; but when it had been developed to the acme of perfection King had brought it to—when the

entire world could be laid bare in all its sordidness and duplicity—X-rayed on a mighty screen before one's eyes—then it did not seem to be such a marvelous and inspiring mechanism. It was in such moments that I came to the vague conclusion that he had brought into existence a machine the world was not ready to receive. Truly, our present civilization, with its uncertain reactions to the swift progress being made, was not in position to "take" to television for centuries to come. And the thought of hundreds of these machines, scattered throughout the world sweeping, and peering into the homes and lives of millions, caused me to sigh with heart-troubled perplexity.

Once I spoke to King about these ideas and his answer only augmented my fears.

"Yes, I know, McManus—all about those things. That's the real reason why we've made such a fight to keep this monster a secret as long as we can. Once television is commercialized, the entire social life of man will have to undergo a decided and sudden change. No longer will he be secure in his secret actions: no longer will he be able to enter his home with the relieved feeling that here is his domain, and here he can do as he pleases; no longer will thievery, murder, and the kindred lawless acts thrive, because the protecting cover of opaque walls will have been removed and the criminal will be living in a world, whose substances, whose constructions, man-made and natural, will be as clear glass. There is no insulator to "televise" rays! There is no metal or composition capable of deflecting or absorbing these powerful rays, *generated with the intention of penetrating eight thousand miles of the solid earth itself!* Yes, man will have to undergo a change."

A LITTLE over six months had passed since the day I had entered Television Hill. All my equipment was running perfectly. Our planes were leaving on schedule three times a day, and oftener as news broke. The work was exacting and interesting to the extreme, and time sped along unregretted. All through these months of worry, of disturbing thoughts, I had come to think more and more of Diane. Despite my earnest efforts I was unable to break down the tantalizing and charming aloof barrier she had set against me. And against me alone!

She was forever asking questions about the marvel of television and could be seen at any time strolling with one of the engineers or workmen, talking about his special work. Of course, knowing this, I spent much of my own time studying and learning about the machine, so as to be able to converse with her. When my conversation drifted toward personalities she became an attentive listener—nothing else.

"Tom," she exclaimed one January evening as I was reading the paper and half-listening to what she was playing on the piano. She arose from the stool with a little spin and seated herself on the sofa beside me. With a pert smile and a light in her violet eyes that challenged argument, she withdrew the paper from my hands and tossed it to the table. I had to smile at her actions.

"Tom, I asked Dad today about the projectors. He said you knew all there was to be known about them, and that you could give me better information than he could."

"What!" I exclaimed with some surprise. "Well, Diane, I believe your father is putting too much faith in my powers of observation. Your father and Wentworth have never told me much of the mechanism in and about the projectors or back of the projection screen. Besides, if they did, I wouldn't be able to tell anyone what I knew. That's my promise to them."

She narrowed her eyes and her voice expressed her disappointment. "Why, Tom, you have never said that before; you used to tell me everything!"

"Yes," I nodded solemnly, inwardly gratified at the display of emotion my assumed refusal was causing. "I did, but now, when you want me to tell you of the inside workings of the projectors, I'm afraid I must refuse, out of respect to your Dad's request."

She bit her lip, studying me. She smiled. "Isn't Dad funny that way?"

For a moment I held her gaze: then she looked away. "No, not funny, Diane—just playing safe!" I stated softly. To my amazement she turned frightened eyes in my direction. Her face had paled and she fidgeted with a corner of a cushion.

"Why, what do you mean by that?" she stammered.

"Oh, nothing to alarm you, Diane. It's just a little trick I've sprung on you to have a little fun at your expense. You know that story I've been writing—the one based on my experiences while here?"

Once more her usual poised self, she replied. "Yes, I know, and some day I'm going to get angry at you for bringing me into your silly story. Don't make excuses! Almost every word I say finds its way into that story. Everything I do, the clothes I wear are explained in vivid description, which I am forced to read—— But, Tom, just how are you going to end it? By bringing in the 'happy ending' so well known of heroes and heroines? Oh, I know you" she laughed merrily.

"That's just what I'm trying to figure out now," I told her. "You see, I'm trying to abide by the popular custom of this type of story—in order to sell it—and destroy the machines, doing away with the inventor and all others associated with the invention, so the world will be safe for Democracy and men again. But, I have exploited the hero and heroine to such an extent that I'll not be able to dispose of them in a manner to suit Mr. Average Reader. I've made her appear with that delightful and haughty air so heart-rending to the hero and so pleasing to the reader, who alone knows she is only 'playing' until the last paragraph, when she will confess to her love."

Diane drew back to the opposite side of the sofa, regarding me with a glance calculated to show haughty disgust.

"She's a strange little thing all the same," I went on, noting the ghost of a smile doing the best to make itself evident," and I've been trying to work her in, as in the employ of a foreign government, spying on the machine, carting off the plans and in the end destroying the entire plant, when she learns she is sealing the doom of the world's peace."

There was a thoughtful frown on her forehead as she retorted. "But, Tom, how are you going to explain the girl is the *daughter* of the inventor of the machine?"

"Oh, that's simple—if I can get away with it. Wilder things than that have been told in this type of story. I make her confess to be a clever substitution, and that the real daughter is imprisoned in this foreign land."

She gave it some thought; then laughed. "But even then, it's such an impossible ending! Isn't it too fantastic to be true to the wonderful story you have written so far?"

"Perhaps, Diane, you can suggest a better one?" I returned, catching her eyes meaningly.

"I could, but it's likely I'd commit myself!" she returned, flashing one of her rare smiles that, I declare, made me feel like going forth to conquer the world.

"BUT, really, Tom won't you tell me about the projectors?" revealing she was determined to learn what she could from me.

"Aw," I frowned. "Oh, well. It sure has me stumped as to why you should be so interested in this stuff. However, I'm going to punish you this evening with a detailed story of all I know about it, so that you will never bother me about it again."

"Is that nice? Maybe, if it were told in the right way, I wouldn't ask so many silly questions," she declared quietly, interested in the nail of her forefinger.

"Well, so be it," I warned settling deeper into the sofa, while Diane assumed a forced attentive attitude, which brought a spontaneous laugh from both of us.

"IT seemed as though your Dad had all the seven devils of luck working at his elbow when he started out to investigate the possibilities of the original liquid films. His search led him into the field of electrical rays in the effort to find a carrier beam for the theory he had built up. He found one that must be closely allied to the Coolidge ray but it is so extremely powerful that it approaches the so-called 'cosmic ray,' besides being able to penetrate through the sphere of the earth. Just what kind of a ray it really is I don't know—neither does anyone else around here except King and Wentworth and two or three others. I don't blame him for wanting to be 'close-mouthed' about it, especially when there's so much danger involved in it.

"The transmitting tube—I've seen one being repaired in the powerhouse—is a monster; being almost thirty feet long and easily ten feet in diameter, a massive cylinder of pure quartz, with a removable section allowing a man to enter and replace defective parts and to renew filaments and arc-carbons. Inside it is a perfect maze of construction, having in dead center a hollow cylinder of platinum alloy in which is suspended the anode and cathode and other elements found in the ordinary high-frequency generator. Around this assembly is a fine-meshed grid-work and outside that a concentric tube of platinum—the plate on which is impressed about two hundred amperes at seven million volts. Then there is an impossible-to-describe assemblage of rods, balls, connections, and other projections all over the inside of the tube, suspended, for the most part, from flat copper straps adhering to the inside of the quartz walls. There are many valve openings through which are fed helium and other similar gases by a system of pumps. For cooling purposes liquid air is pumped through the high-voltage electrode which is made of two separated plates.

"When this projector-tube is in operation, the hiss and spit of hundreds of amperes leaping across the six-inch space in the rear arc causes a deafening roar inside the projector housing. The rush of gases through the lead pipes makes up a heavier beating monotone pounding on one's ears, while the awe-inspiring blaze issuing from the unshielded openings in the thick lead walls makes one feel all the more the exhilarating aura of high tension electricity surrounding the entire projector assembly. Why, one comes to believe he's dead and is in an eternity of thunder and pleasant tingling!"

"But, Tom, why all this power?"

"You may have heard, Diane, of scientists taking pictures concealed by an inch or more of lead. You know it takes considerable power and equipment to accomplish that successfully. Then, how much power would you require were you to photograph an object hidden by three thousand miles of the earth's soil and minerals? Your brother Jim wrote recently to your Dad that he was present at some experiments conducted at the G. E. plant where a giant Roentgen generator has been built. They have been able to photograph composite views of objects and houses two and three hundred feet away from the tube itself. An X-ray tube of this size is necessarily a powerful one and requires much power to operate it!"

"Out of King's projector tube there issues a beam—just what you would call it I do not know, except that it is capable of penetrating the earth's body; it may be a tunnel of rays through space itself, perhaps ether, traversing all matter as water through a sieve, kerosene through cast iron, infra-red rays through hard rubber. However, it has one property, a most curious property, in that it is a conductor of ordinary electrical impulses! A radio transmitter could be hooked up in the path of this beam and become what our present radio engineers are earnestly working toward—a perfect radio beam transmitter. A beam transmitter which could only be picked up in an area less than a hundred feet wide and two hundred feet high at a distance of a thousand miles—the extreme limit to which the minimum divergence of the rays can be held. And then there is the much-desired advantage not enjoyed by modern radio transmission—that of being focused directly upon the distant receiver once the beam-line dips below the curvature of the earth. In like manner, with ordinary equipment, electro-photographic television and pictures could be sent to a picked receiver, thereby clearing up the crowded condition felt today in the established practices of wide-spread aerial broadcast. I don't know whether you are interested or not, Diane, but a noted radio engineer who is striving toward 'wired' radio, is proving his contention that radio transmission belongs underground; King holds the key for this latest development.

"I'm going to try to draw a comparison between the principles used in Movietone and Photophone 'sound' systems and the theory King has proved possible. The former systems transform sound vibrations to electrical impulses that actuate a 'kino-lamp' whose fluctuations are registered on the narrow band of film seen to the left of the screen when projected. In projection the sound is 'taken' off either a few feet before or after the frame containing the expressed audible action is shuttered through the lens compartment. Behind the narrow band is a powerful light and the light passing through the film is impressed on the sensitive photoelectric cell in exactly the same 'flickering' as the original kinolamp. This 'flickering' controls the current passing through a photo-electric cell, breaking it up into surges of electricity, which when properly amplified and sent to the speaker hidden behind the screen, produces the words and music we hear so clearly and so perfectly timed.

"Your Dad played with a system similar to this back in 1925 while he was testing and developing a series of new tubes and amplifiers. Not satisfied with this cheap success, which he knew would come into general use within a year or two, he had carried on his intensive research work along into the discovery of these 'telesight'

rays, as he sometimes terms them. He had found that electric currents of various wave-lengths sent along this beam were reflected by objects in the path of the rays and *returned* with appreciable strength to the transmitter *via* the beam! His further search revealed he would get 'ghost' pictures of everything in and between the range of his instruments. Then, after much thought, he decided to make two projectors, separated by miles, and focus them on the object, figuring he'd get additional reflection and delineation from the object. He figured rightly. His receivers, something on the order of thirty to fifty stages of fixed-tuned radio-frequency, caught the reflected electrical impulses and converted them, by proper scanning mechanisms, into light frequencies again."

"Pardon me, Tom," broke in Diane laying her hand on my arm, "where are those receivers located?"

"They are mounted in the 'nose' of the projectors and are 'tuned' and focused in conjunction with the projector each serves."

"But, I don't understand how they can pick up the extremely weak reflections from distant objects. I know ordinary radio waves can be turned aside and absorbed by steel constructions, but I imagine they are scattered pretty well over the surrounding vicinity and therefore must be exceedingly weak."

"Clever little mind! Here is how that can be explained: those impulses strike *all* objects in their onward rush and there are many and untold reflections in all directions, but the greater percentage would naturally come from the point or place where two projectors would be focused. The receivers are also focused automatically on this point and so, they register to these stronger reflections riding 'back' over the weaker ones. Edison proved it possible to run two-way communication over the same wire, and King has proved it possible to send and receive the same electrical or radio impulse over a beam that, actually, is a better conductor than silver! Now, if you have been following me, you ought to ask how it is that these delicate receivers can pick up these minute reflections when they return right in the path of the outgoing powerful impulses."

"That question would be logical," she replied.

"Diane, much as your Dad has done in the research and development of the electrical and chemical end of television, he would have been handicapped were it not for the rare mechanical genius residing in Wentworth. It was Wentworth who first saw the need of positive and precise control of the projectors, and it was his brain which first conceived those mighty machines in their present state. Yet, compared to the work he did there, and the system he developed to control these monsters by means of a single manual control-board, the marvelous piece of engineering found in the nose of the projector assembly transcends all his previous accomplishments.

"From now on, Diane, my lecture is going to become more or less indefinite as to details, because I'm speaking of something I really know very little about, having gained my information from remarks of the men and from one or two chance glances at the machinery.

"We know that the main oscillator tube projects a beam no metal can absorb. Directly in front of this tube (speaking of the front as the place where the rays are emitted) is a series of scanning discs about ten and a half feet in diameter. The rear disc, that is the one closest to the tube, is about ten inches thick and is composed of an alloy of lead and copper, and has a steel band sweated to its circumference to keep the disc from flying apart at the high speed at which it is revolved. In it, in conventional scanning disc manner, are the two hundred or more slots arranged in a spiral, each slot being approximately two inches apart centerline to centerline. Then, in front of this scanning disc (known as the 'transmitter disc') is mounted the 'receptor disc'—similar in size and whose axle runs as a sleeve over the 'transmitter disc' axle. The 'receptor disc' in reality, is made of two plates of bakelite an inch or so thick, separated by a space of twelve inches. It is between these latter supporting discs that the 'receptor antenna,' two hundred little cylindrical objects, each as big as a tomato can, are arranged in the same positions and centerlines as the slots on the 'transmitting disc.' Both of these wheels, transmitter and receiver, can be driven at the same speed, but since the axles are 'sleeved' the 'receptor disc' can be retarded or advanced. The reason for this I will explain in detail. In my opinion, it is the most marvelous piece of work in the entire television machine.

"Once more, the carrier beam is a continuous emission, understand? The electrical, or rather the radio-frequency impulse riding this beam is *not!* It is an oscillating current breaking abruptly on and off about five hundred thousand times a second! Since no physical means can be found whereby the transmitting scanner can be made to cut off the penetrating beam, as does the scanning disc in a light-governed television machine, King had to resort to breaking the 'secondary wave' so as to scan distant objects. This oscillating impulse is timed with the speed of the 'transmitting disc' so that the 'shots,' stronger where they have passed through the open slots, dash out and are away across the ether. Objects in the path of the beam reflect this 'secondary wave,' which reflections ride back to the transmitter, if they happen to be returned—most do, because of a law which states: the angle of reflection is equal to the angle of incidence. Naturally, the reflections returned by the object on which two transmitters are focused will be stronger and so they will register that much clearer. These reflections, upon their arrival back at the projector some minute fraction of a second after they had left, will find the 'receptor disc' with its antenna coils right in line to pick it up. The 'transmitter disc' has moved onward and is then engaged in projecting other 'shots.' The movement of the solid part of the wheel *slightly* screens the returning impulse from 'colliding' head on with an outgoing impulse.

"Now, Diane, for the interesting part of the whole affair; and that is the reason for the independent movement of the two scanning wheels. This calls for an 'example.'

"Let's say that the transmitters were tuned on a spot in New York City, which, we'll say, is nine hundred and thirty miles from Television Hill. It would take just one one-hundredth of a second for an electrical or radio impulse to travel that distance and *RETURN*. That means: by the time that impulse leaves the transmitting slot, and before it returns, a hundredth of a second later, both discs must revolve enough to bring the 'receptor antenna' into position to receive it! Just think of that for a few moments.

"For every mile you approach nearer to the transmitter, the discs will have to spin faster, for you're cutting down the elapsed time of going and return of the

impulse traveling, roughly, one hundred and eighty thousand miles a second! Can you imagine the unthought-of speed those ten-foot wheels would be spinning if we came as close as Chicago, one hundred miles away? Why, they would burst into a million pieces and wreck the entire projector, on account of the terrific centrifugal force generated!

"No, Diane, Wentworth knew his engineering. Those discs revolve only sixteen times a second and the difference in the elapsed time elements are made by simply retarding or advancing the position of the 'receptor disc' in relation to the slots in the transmitter by means of a most ingenious method of gearing, automatic in action and which is synchronized with the diverging or converging of the beams of *BOTH* active projectors. Then, the thing that sounds impossible! Both scanning discs are so timed that the impulse from, let's say number one slot on Television Hill's transmitter, leaves at the same instant as the impulse of number one slot at Lake Geneva, and *BOTH* these impulses strike the object on almost the *same* spot, being reflected back as *one* strengthened impulse, which is picked up by the 'receptor antenna' amplified by the receivers, transmitted over seventy-five miles transformed into vibrations in range of sight, and thrown on a screen—perfect images of the original scene. All this is done in the space of a fraction of a second. When you realize that over thirty thousand impulses ride out of the transmitting slots in the sixteenth of a second, that each has to go through the story I've tried to tell you, you will come to think as I do—your Dad and Wentworth are centuries ahead of the times.

"All this equipment—the great power house, the monster projectors, the delicate scanning mechanism, the wonderful control system, almost wholly automatic—all is required to obtain a weak, pulsating current of a few milliamperes at seven hundred volts. Scarcely enough 'juice' to shock the average person."

Diane stirred and settled into a more comfortable position.

"Enough?" I smiled.

"No, please go on. For one who stated he only looked at the machine, you certainly absorbed quite a lot of information!" she laughed—those violet eyes twinkling merrily.

"Diane! Now, you did it. You made me forget my line of thought."

There was a mischievous narrowing of her lips as she said, "the received current is carried from the projector housing down into the little shack under the projector, where it is stepped up to sufficient strength to carry it through the tunnel, to the transformer-house, to the towers, where it is conveyed to the projection house, passed through a series of filter-condenser-resistance amplifiers, cascade type, to the Kino-lamp."

For a moment I gasped at her breath-taking detailing.

"Say, what's the idea? I thought you wanted me to tell you the story? I'm beginning to think you know a lot more about this subject than I do. I am willing to wager you are only using this means as an excuse to talk to me." It was a bold assertion and I anxiously awaited the expected explosion.

Instead, she fought back a smile, averting her eyes for an instant. Then she dared a glance in my direction and in those violet depths I read the answer that words can never convey. She did care!

"Please, Tom, go on," she begged a slow flush creeping into her cheeks. Our eyes met.

End of Part I

What Do You Know?

READERS of AMAZING STORIES have frequently commented upon the fact that there is more actual knowledge to be gained through reading its pages than from many a text-book. Moreover, most of the stories are written in a popular vein, making it possible for anyone to grasp important facts.

The questions which we give below are all answered on the pages as listed at the end of the questions. Please see if you can answer the questions without looking for the answer, and see how well you check up on your general knowledge of science.

1. If radio waves do not have to follow the curvature of the earth how would it affect the distance they would have to travel between stations? (See page 982.)
2. What is one of the great objects our radio engineers are working up to? (See page 985.)
3. What improvements would be effected by beam transmission of radio? (See page 985.)
4. Can you describe the production of voice by the movie film? (See page 985.)
5. How long would it take for a radio impulse to go from Wisconsin to New York, taking it as 930 miles distance? (See page 986.)
6. What is cacodyl and what is its function in its cyanide? (See page 1010.)
7. What is a bodhisattva? (See page 1011.)
8. What is the approximate orbital speed of the earth? (See page 1033.)
9. What is the approximate distance from the earth to the moon? (See page 1033.)
10. What is the height as determined by observation of a well-known mountain on the moon? (See page 1034.)
11. What is one theory of the way of formation of the radial streaks emanating from Tycho? (See page 1035.)
12. What is the length and breadth of the largest of these rays? (See page 1035.)
13. What is the approximate ratio of the moon's gravitation to the earth's? (See page 1037.)
14. About what is the distance a body would fall through on the moon in the first second? This is one-half the acceleration of the moon's gravity. (See page 1038.)
15. How do the craters on the moon compare with those on the earth and with crater lakes? (See page 1038.)
16. How do the shadows on the moon compare with those on the earth and what is the reason of the difference? (See page 1039.)
17. How much light does the earth give to the moon? (See page 1040.)

Illustrated by
MOREY

¶ *Those that remained wore special clothes. . . . All beehives were quickly robbed and the bees killed off . . . but even if pickers of fruit could be found who would run the risk of being stung, the insects were always ahead of them, devouring the fruit . . .*

The Bees *from* Borneo

By Will H. Gray

Author of "The Star of Dead Love" and "The Tide Projectile Transportation Company"

UNQUESTIONABLY, the bee is one of the wonders of the world, and the work of the apiarist, therefore, is important. The very limitations that control the bees are most interesting, for there are many variations among them, and the queen bee is one of the miracles of the insect world. What a Burbank among the apiarists might develop, accidentally, or otherwise, is problematical, to say the least. One very striking possibility is excellently portrayed in this story by Mr. Gray, one of our early popular authors.

SILAS DONAGHY was by far the best bee-keeper and queen breeder in the United States; not because of the amount of honey he produced but because he had bred a strain of bees that produced records. Those two hundred hives consistently averaged three hundred pounds of honey each. Naturally enough, everyone who had read about his results in the different bee journals wanted queens from his yard, and his yearly production of two thousand queens was always bought up ahead of time at two dollars each, which is just double the usual price.

Silas was a keen student of biology besides an expert beekeeper. He had tried all the usual experiments with different races of bees before falling back on Italian stock, bred for many generations in the United States for honey-gathering qualities, gentleness, and color.

Although he had achieved commercial success, he still found the experimental side most fascinating, especially with regard to artificial fertilization of drone eggs—a comparatively simple matter, only requiring a little care. His greatest ambition was to cross-breed different species and even different genera. From his studies he found out that the freaks exhibited in side shows were not crosses between dog and rabbit or cat and dog, as advertised, such things being impossible, owing, it is thought, to chemical differences in the life germs.

Every beekeeper knows that the queen bee lays fertile or unfertile eggs at will. One mating is sufficient for life, and after it the queen can lay a million or more fertile eggs at the rate of as many as two thousand a day in summer. The fertile eggs become females, either workers or queens, depending on how they are fed, while the unfertile eggs hatch out into drones, which are the big, clumsy, stingless males. For the most part they are useless, for they require the labor of five workers to keep them fed, and only a very few ever perform the services for which they were created. Nature is very bounteous when it comes to reproduction, but seems to desert her children once they are safely ushered into this wicked world.

All might have gone well if someone had not sent Silas Donaghy a queen bee from the wilds of Borneo. After careful examination, he introduced it to one of his hives which he had just deprived of its own queen. In a month's time the new brood had hatched and were on the wing; pretty bees they were with a red tuft on the abdomen and long, graceful bodies with strong wings. Soon the honey began to come in and pile up on that hive, which was mounted on a weighing scale. Up and up crept the weight until Silas saw that he had something as far beyond his own strain as his own were above the ordinary black bee. In his enthusiasm for these new and beautiful creatures, he overlooked the source of their honey. Not alone did they gather from the flowers but from every plant that had sweet juice in its stems or leaves, and they did not hesitate to enter other hives and rob them of their stores. In fact, wherever there was a sign of sugar, they seemed to find it and carry it off. When that hive had piled up a thousand pounds of honey, Silas took eggs from it and put them in every hive he had. Risking everything, he bought extra hives and equipment and raised five thousand of the new queens, which he sold for five dollars each. Soon his mail was flooded with letters of two kinds; one lot praising his queens as the most wonderful honey gatherers in the world, the other abusing him for scattering a race of robbers that were ruining crops and cleaning out all other hives within a radius of five miles.

Things might have righted themselves if it had not been for a California senator who owned two thousand

hives and had them completely robbed out by another beekeeper who had only five hundred, all mothered by the new Borneo strain.

By means of influence at Washington, and without consulting the Bureau of Entomology, this senator had the mails closed to Silas Donaghy's queens. It was a dreadful shock to Silas because he had already begun refunding people their money and replacing the queens free of charge. Now he could no longer make amends, but the letters of abuse continued to come in by the hundred. He said nothing, but devoted himself more and more to his experiments.

IT was with an ordinary wasp or yellow jacket that he succeeded in producing a creature that soon turned the continent upside down.

Under his super-microscope he was looking at an unfertile egg of a Borneo queen. Something buzzed into the room and flew around the microscope, making a breeze that threatened to blow away the delicate egg from its glass slide. Impatiently he put out his hand and to his surprise caught something between his fingers. It was a drone wasp and he had partly crushed it. An idea suddenly struck him; he took a fine camel's-hair brush and touched it to the fluid containing the microscopic spermatazoa or life germs exuding from the dead wasp. With infinite care he applied the brush to the large end of the tiny, cucumber-shaped egg on the stage of the microscope. Presently he saw several minute, eel-like creatures burrowing into the egg. One outswam the others; its long tail was replaced by protoplasmic radiations and it united with the female pronucleus. With a tense look, the experimenter sat on with his eye rigidly glued to the microscope.

Had he succeeded? Would cleavage take place? He was called to lunch, but the call went unheeded. At last the pronucleus elongated, became narrow in the middle and finally split into two.

Wonderful! Extraordinary! It would seem that he had accomplished that which no other man had ever done.

Carefully he transferred the wonderful egg to a queen cup and covered it with royal jelly, that special food that in quantity would make it a queen.

Now he must trust it to the tender mercies of the bees, for no man knows the exact constituents of the food fed to the larvæ day by day. Then there is always the chance that the bees will reject the egg thus offered to them; they show their disapproval by licking up the royal jelly and devouring the delicate egg.

Silas went through agonies in those three days that it takes the egg to hatch. Everything went as it should, and in fourteen days he had a perfect queen resembling a wasp except for a few reddish hairs on the abdomen. His anxieties were not yet over, for a week after hatching the queen goes on her wedding flight. High up into the air she soars with all the drones after her in a flock. To the strong goes the victory, but his joy is short lived, for after one embrace he falls to the ground, dead, his vitals torn from him and attached to the queen. Such is the queen's first flight and after it she returns to the hive to lay countless thousands of eggs. Had he wished to, Silas could have fertilized the queen by the Sladen method, almost amounting to an operation, but he thought it wiser to let nature take her course.

On the seventh day the young queen came out of the hive, ran about the alighting board nervously for a minute, then took a short flight to get her bearings and finally shot into the air and out of sight while the drones followed in desperate haste.

Silas waited and watched, but she did not return. Days passed and his spirits fell to zero, for the chance of a lifetime had slipped from his grasp.

It was a month or so later that young Silas came running into his father's study one morning with the news:

"Oh, Father! Come quick and bring the cyanide. There's a wasp's nest bigger than a pumpkin down on a tree in the wood lot."

"Now, Silas, I've often told you not to exaggerate. You know it isn't that size."

"Well, Father, it's enormous, anyway."

When Silas, senior, went down to investigate he found his son's description not in the least exaggerated. If anything, the size was underestimated. There, to his astonishment, hung the largest wasp's nest he had ever seen or heard about. The insects going in and out seemed different from the ordinary yellow jackets. Walking over to investigate, he received a sting that temporarily knocked him out. He was well inoculated to bee stings and they hardly affected him, but this was something quite different. Some way or other he reached the house and collapsed on the doorstep.

It was three days before he was about again, feeling very shaky on his legs. He did not lack courage, for he took a butterfly net and veil and went down to see how the new insects were getting along. The nest was bigger still and the numbers of bees coming in and out had greatly increased. He managed to capture one before he was chased home, and a sting on the hand, though very painful, did not incapacitate him so badly as the first had done.

To his astonishment the captured insect had the red tip to its abdomen. Here was a great discovery. His escaped queen had settled down on her own account and started a paper-pulp nest like ordinary wasps instead of returning to her own hive. Interest in the new species overcame everything else in his mind, even the severity of the sting.

Putting the captured specimen in a queen mailing cage, he posted it to the professor of entomology at the State University, who had been friendly to him through all his late troubles. Alas for the regulations which he had quite forgotten in his excitement. The Post Office people returned his specimen with a prosecution notice. He was summoned to court and heavily fined.

While he was away from home, little Silas was stung by one of the bees and died the same evening.

Something gave way in the poor man's mind and he hated the whole world with a deadly hatred.

Making himself a perfectly bee-tight costume, he sat near the great nest for hours at a time, capturing young queens as they emerged. Next he bought a gross of little rubber balloons and some cylinders of compressed hydrogen. Making small paper cages, he attached an inflated balloon to each, put in a young queen and started them off wherever the wind would take them. When the queen got tired of her paper prison, she chewed her way out to freedom and, single-handed, started a new colony.

IT was getting late in the season and the new strain of insects did not make much headway before the cold weather set in.

Early the next spring the country papers began to complain of the prevalence of deaths from bee or wasp

stings. Every year some people die of stings, but now the number was greatly increased. Animals also were frequently found dead without apparent reason. Many people got stung and recovered after a week in bed.

In the cities these constant accounts from the country became a sort of joke. The words "stung," "sting" and "stings" were used on every occasion, in season and out. When a man was away from work without permission, instead of saying he was burying his grandmother he said he had been laid up with a bee sting.

At last official notice was taken of the new menace and they were recognized as being descended from the famous Borneo queens. The bees from Borneo were now discussed in every state in the Union. The cities were still joking, but the country people were getting desperate. Many had sold out for what they could get and had moved to parts not yet infested with the new pest. Those that remained wore special clothes, had all doors and windows carefully screened, and took every precaution not to let the insects into the house. It was soon discovered that even the chimneys had to be covered when fires were not burning. The new insects had to have sugar as well as insect or flesh diet, but they preferred to get their sweets in any other way rather than from the flowers. All beehives were quickly robbed and the bees killed off. Soon it was realized that there would be no fruit crop in many districts, for even if pickers could be found who would run the risk of being stung, the insects were always ahead of them devouring the fruit as soon as ripe.

The cities began to wake up when the new insects found that open fruit stalls and candy stores were theirs for the taking. They built their nests from waste paper or old wood or any fibrous material that they could find. The nests were built high up under cornices and gables where it was very difficult to find them and still more difficult to destroy them. The death toll was now greater, for the city people were not inoculated as many of the country folk were. One in every four died from the stings. The conversation became more serious, the papers had a special column for deaths from stings. A fellow worker would not turn up at the office; his friends looked at each other gravely and cast lots to see who should ring up to find out the sad news. If he did come back after being in a hospital he was hailed with enthusiasm.

All the leading scientists and doctors were working hard to devise a serum or antitoxin. Some brave men were undergoing a series of injections with formic acid to see if it would immunize them. Every newspaper had a list of so-called cures sent in by people who professed to have cured themselves or others. It was hard to judge these things, for it was impossible to know if the sting were really of a Borneo queen and not of some other hymenopterous insect. Panic alone killed many, so great was the fright of those stung by any insect. Those who recovered from a sting practically never died when stung again; this fact was of great use when recruiting began later on in the year.

A dreadful catastrophe raised the menace of the bees to an importance exceeding everything else.

A trainload of molasses was entering a suburb of a great city where the bees had obtained quite a foothold. The engineer was stung in the face and staggered back into the arms of the fireman. A lurch and both fell out on the track. On rushed the heavy train with throttle open. Soon it entered the yards at great speed, jumped the switches and collided with an outgoing passenger train. Sounds of rending steel and splintering wood filled the air. Roaring, hissing steam drowned the cries of the injured. Over track and wreckage spread a turgid mass of strong smelling molasses.

Before the work of rescue was half completed the air was swarming with millions of buzzing insects. Doctors, nurses, railway workers, policemen and ambulance drivers were stung into insensibility and death: To complete the awful drama some well-intentioned persons bravely started smudge fires, hoping to smoke away the bees. Now fire was added and the flames licked through the seething, treacly mass, converting it into a holocaust such as had not been witnessed since the days of the Great War. Five hundred persons lost their lives through accident, fire and stings. Thirty or forty casualties, at the most, would have been the total if it had not been for the bees.

THE nation was awake now. Complete destruction of this new pest was demanded in all the great newspapers. Expense could not be spared in such an emergency. There must be no half-hearted measures, for the very life of the country was being strangled by the creation of a madman.

Volunteers were organized all over the country. They were equipped with extension ladders and strong sacks, which they put over the suspended nest, drew tight the running string, and transferred the whole thing to a woven wire burner, where it was sprayed with gasoline and burnt. At first they seemed to make some headway, but a fine spell of weather and millions of emerging young queens gave the bees fresh impetus and the newly started nests could not be found so easily as the large old ones.

The national capital proved a specially happy hunting ground for the bees. The public buildings provided thousands of nooks and corners where the nests were not discovered until they were as large as barrels. Sometimes the weight would break them down. If they fell in a street, there were sure to be many deaths before traffic could be diverted, and men protected to the last degree destroyed the insects with flaming sprays and poison gas. At last things became so bad that the seat of government was moved to a town in Arizona which had not yet been invaded by bees.

Many new industries sprang into being, for anything advertised to combat the pests found a ready sale. Traps of every size, shape and description were sold; many of them more ingenious to look at than practical in use. Poison baits were sold and used by the ton, many harmless animals and not a few children fell victims to its use.

In spite of everything the pests went on increasing in numbers until the country seemed on the verge of bankruptcy. When farm mortgages, considered so safe, fell due, it was not worth while foreclosing them, for the land was useless. The new insects did not pollinate the fruit, but they destroyed the insects that did. Farm produce rose to unheard-of prices. Passenger traffic was reduced to a minimum, for nobody traveled who could possibly avoid it. Excursions and pleasure trips seemed to be a thing of the past. Even free insurance against stings did not stimulate travel, for no one seemed keen on being stung, however big the compensation to their heirs!

When fruit reached a certain price, large syndicates bought up fertile stretches for almost nothing and screened them in at enormous cost. In these enclosures

the most intensive culture known was practiced with very profitable results. Not alone were there gardeners, but numerous guards patrolled the high framework with shotguns charged with salt ready to shoot any bee that should find its way in. Common bees had to be introduced from great distances for pollination purposes.

SILAS DONAGHY gibbered and raved in the state asylum; when he saw anyone stung he was convulsed with mirth. From morning to night he played tricks on the attendants, doctors and other patients. They never could tell when he might have a bee concealed about his clothing or wrapped in his handkerchief. It was most disturbing to the officials to get suddenly chased by a man who held sudden death in his hand. They put him in the padded cell, but it did not disturb him in the least. When his food was brought, he imitated the buzzing of a bee so skilfully that the attendant dropped the food and ran, followed by Silas' unearthly shrieks of merriment. At times he appeared quite sane and would skilfully catch and kill every bee that accidentally got let in. When he got stung himself, which was very rarely, he would wince with the pain and fall to his knees and grope about half blinded for support while the poison coursed through his veins. Getting to his feet again, he would stagger about with the tears of agony running down his cheeks, the while laughing at himself and cursing his weakness. Those who saw him marveled, for most people collapsed in a writhing heap and mercifully became unconscious.

In his sane moments he begged for his beloved microscope and experimental equipment. At last, to humor him and incidentally save themselves unlimited trouble, they gave him a little hut in the grounds where he could do as he liked so long as he did not annoy anyone. The first thing he did was to tear off all the screen wire and let the bees have free access to his living and sleeping rooms. He even let them share his meals and they sat in rows on the edge of his plate. It wasn't long before there was a nest right above his bed; it remained there undisturbed, for no one went near his little abode. The official bee swatters kept clear of Silas, for they had their dignity to uphold and Silas made fun of their bee-tight costumes and elaborate equipment. He could kill more bees in a day, if he wanted to, than they could in a week.

The Government was still busy working out methods to control the plague. One that seemed to promise some success was the introduction of a large fly belonging to the hawk-like family that prey on honey bees, catching them on the wing and tearing them asunder to feed on the sweet juices within. These flies were bred in great numbers and distributed over the country. Spiders and bee-eating birds were also extensively tried out.

With the first cold days of autumn the nation breathed more freely, for the Borneo bees were even more sensitive to cold than the ordinary hive bees. So great was the relief that all the activities of summer began to take place in the winter. People went visiting and the railways ran excursions. Such is the spirit of the people that they quickly forget their troubles and trust that the past will bury its past. But the entomologists of the country knew and trembled at the thought of spring when the fine weather would entice from their wintering places thousands and millions of queens that would quickly construct nests and raise broods that would far exceed anything that had yet gone before. A bounty of ten cents a queen was offered and thousands of people collected the dormant insects from their hiding places. Special instructors visited all the schools, telling of the dangers that awaited them if the queens were not destroyed now.

The fine weather came and with it the queens came out of their hiding places in countless millions. Those gathered were as a drop in the bucket, compared to those left undisturbed. For a few short weeks things got steadily worse and worse. All the devices of the previous year were used and a lot of new ones. Single screen doors were no longer of any use. Double doors were better, but the most reliable system proved to be a cold passage kept at a very low temperature. In this passage the insects became chilled and could be swept up and destroyed.

Every day now seemed closer to the time when things would end. A heat wave came along and the overstrained public services collapsed. The dead lay in the streets. The frantic telephone calls went unanswered. Even the water pipes were choked with the dead insects and the water tainted with the acrid poison that also filled the air.

Those who had the means and were able fled to other parts where the breakdown had not yet occurred. The military forces of the country were fully organized for relief purposes and those who remained were rescued from the cities of the dead.

The State Lunatic Asylum collapsed with all the rest of society and patients wandered out and were soon stung to death.

SILAS was undecided what to do at first. Then he thought it would be a good plan to put the screen wire back on his shack. The bees objected to the hammering, so he waited until night and did it then. He was rather disappointed at having to destroy the nest inside, but it could not be helped. Several visits to the storeroom of the asylum yielded all the food he needed. For a few days he remained in solitude, then he packed his beloved microscope, put on a light bee veil and started home over the deserted roads. He was careful not to annoy the insects in any way. He never batted at them or made quick, jerky movements and he avoided going near their nests. He took it very easy so that he would not perspire, for bees hate the smell of sweat.

Sad sights met his gaze as he trudged along. The whitened bones of cows and horses and smaller animals littered the fields, for the insects picked their victims clean, requiring as they did a partly animal diet like ordinary wasps. A disabled truck stood by the roadside and sitting in the driver's seat was a grim skeleton. Further on a cheap touring car lay on its side and four skeletons, two large and two small, told the sad tale of a family wiped out in a few minutes. These sights did not seem to affect Silas at all; he was more interested in the nests that hung from every tree and telegraph pole and from the gables and eaves of houses and barns. Once he was overtaken by an armored and screened military ambulance. He refused their aid and they hurried on, the wheels crushing a bee at every turn. A crushed bee is smelled by the other bees and they are immediately on the warpath, so Silas had to leave the road and take to the fields.

When he reached home he found his wife alone in the well-screened house. She had been ostracized by all the neighbors long before they had left, and only for Silas' letters of instruction, she could not have carried on single-handed. Somehow she had expected Silas. He entered by the cellar steps and slipped through so dexter-

ously that only seven bees got in with him. They flew to a window, where he quickly killed them, for Mrs. Donaghy, strange to say, had never been stung. He took off his outerclothing and found five more. Disposing of these, he went upstairs and carried his microscope to the study, where he carefully unpacked it and put a glass cover over it. He fussed about the study in an absent-minded way until Mrs. Donaghy called him to supper. Sitting down, he looked at the place where little Silas used to sit.

"Where's the boy?" he questioned. "You know I like him to be on time to his meals."

A pained look came over the poor lady's face.

"Silas, you know he's gone."

"Gone where? What do you mean?"

She looked up flushing and for the first time in her married life spoke with heat:

"Dead, you know he's dead; stung to death by one of your accursed bees."

Silas collapsed on the table. Covering his face with his hands, great sobs wracked his body. "My God, my God, what have I done?" he moaned.

Presently he was in his study again, looking at everything with a new light in his eyes. He was alert and methodical now, and there was a set appearance about his jaw that had not been there for a long, long while.

Taking the plug out of the keyhole, he waited till a bee came in and dexterously catching it by the wings, brought it to his study. His tired eyes were bright now and he appeared to be looking at something he had never seen before. Frequently he came to the living-room to ask his wife questions about what had happened in the last year or so. He seemed appalled, but a glance from any window verified all she said.

That night he visited a deep bee cellar constructed underground where he used to winter some of his colonies. He found that it had been used as an ice house while he had been away. Seeing an old hive in the corner, he went over and lifted the lid. To his utter astonishment a faint buzz greeted him that was quite different from the high note of the all-pervading pest outside. Here was the remnant of a colony of honey bees that had been forgotten. How could they have survived all this time? He didn't know, unless it was the ice making a continuous winter for two years. Shouldering the hive, he carried it out and placed it in a little screened chicken yard where Mrs. Donaghy had endeavored to raise a few vegetables. Next morning the survivors were buzzing about getting their bearings, though there wasn't much fear of their straying very far in the little enclosure.

FOR the next week Silas hardly slept or took time to eat. If he wasn't at the microscope he was in the small yard where the last honey bees in North America flew about and licked up the honey given them. Little they knew that the fate of a continent depended on them.

At last he produced a drone that seemed to fill the requirements. It must be able to outfly the drones of the vicious half-breeds all around. It must be able to produce grandsons for by the laws of parthenogenesis a drone cannot have sons that would also be swift and amorous. It must produce daughters and granddaughters resembling honey bees and incapable of surviving the winter alone.

Most scientists would have waited to test out these qualities before scattering the new product broadcast. Silas, however, was always impetuous, as the sale of his first Borneo queens had shown him to be. He realized now that the situation might be better but could not be worse.

Setting to work in his little enclosure, he bred drones in large numbers and liberated them. If only he had some way of distributing them quickly! Balloons and hydrogen? Alas, he had neither. He wandered about, thinking hard. There in the basement stood the little lighting plant with its neat row of batteries and a large jar of acid in the corner. Ha! There was hydrogen, either by electrolysis or more quickly still with strips of zinc or nails and the acid. Paper bags would do for the balloons.

In a day or so he was sending the drones off on the wind by the dozen together, hoping that they would seek out the young queens wherever they went and father a new race of harmless bees that would die out entirely in the winter.

In a month he noticed young queens without the familiar red tuft on their tails. Capturing a few, he put them in his enclosure and fed them carefully, even opening a precious tin of meat to help them along; but they did not respond and some died. They were incapable of living alone. However, those put into nests flourished and outdid their vicious half-sister. It was a treat to see the new drones on the wing rushing about in their wild search for virgin queens. The workers of the new breed had barbed stings and died on using them. It was not very painful either.

Every day now Silas was in his garden getting things to rights, planting and harvesting. He smiled now at the millions of bees, for they were all different from the old race that was quickly dying off.

He often wondered if there was anyone else alive. Making a trip to the deserted village, he was rummaging around looking for canned goods when he was astonished to hear a telephone ring. It was a long distance call searching for anyone alive.

"The bees have played themselves out," he was told. "The breed did not hold true. Nature righted herself automatically."

Silas went home smiling. He knew that he had started and ended the awful plague.

THE END

Zippers in the rubberized wall fitted into the front of the suits. Consequently, the doctors and assistants could leave the plague room with no danger of carrying the cultures out with them.

The

Illustrated by WESSO

Purple Plague

By Russell Hays

OBVIOUSLY, the war to end war has not ended war and very likely all the peace conferences, etc., will not forever eliminate this atrocity of mankind. And if we look upon the latter-day methods of warfare as horrible and devastatingly wholesale, what will those of us who see the day of the next war, which must necessarily be far more intensive, have to look upon? Chemists are now an established entity, not only during peace time, but to create new and more horrible atrocities for warfare of the future. At least one very logical idea is ingeniously worked into this yarn. Our new author gives us here an absorbingly exciting story that is scientifically instructive as well.

HISTORIANS are agreed (if we may accept the findings of the latest assembly of the Society of International History held in London in the spring of 1995) that the late war between the Caucasian Allies and the Far East Entente was built upon two major premises. The first of these was the completion in 1943 of the Trans-Asiatic monoline railway commonly known as the K. K. between Karachi and Kiaochow with the subsequent economic alliance of China, India, and Japan; and the founding of New Hankow, the Golden City, on the headwaters of the Yangtze.

The second was the outspoken defiance of Dr. Tsai Yong, spokesman for the Chinese hierarchy, to the Chinese quota agreed upon by the International Conference of Race Limitations held in Tokio in 1976.

As for the Foundwell Embargo which precipitated hostilities, there is naturally a great deal of condemnation. In itself, however, it was no more responsible for the catastrophe than a breeze which hurries the tides. The results of the maelstrom which seized upon the world during those lamentable three years (1978-1981) are only too well known. It was, as is now more clearly realized, a war of test tubes; a chess game of scientists in which more than half a billion lives were the pawns.

Espionage, because of the radical racial characteristics of the combatants, was extremely hazardous and at best uncertain. Yet that it was successfully achieved, is only too well evidenced in the fearful stroke dealt the Caucasian Allies by the simultaneous induction of the Blue Plague cultures into the water systems of the chief Caucasian cities.

As is now known, the bacillus of the Blue Plague was the discovery by, or perhaps we should say the result of, the researches of the late Dr. Chang Lin, third Lord Ruler of the University of Sun Yat-Sen established in New Hankow in 1947. Chang, the only child of a union between a Chinese coolie and an exiled Russian noblewoman, was without doubt one of the greatest chemists and biologists the world has ever produced. Ten years previous to the war he had already gained fame through his ray-cure for tuberculosis and his Theory of Induced Mutation.

In 1976 he is credited with a statement to the effect that he had successfully combined or inter-bred bacilli resembling each other culturally, but differing in mobility to produce a bacillus possessing the combined characteristics of the parent cultures. Later developments lend strength to the assumption that this was the original bacterium from which came the cultures of the Blue Plague.

"Nor can there be any doubt," quoting from a paper by Dr. Thomas A. Breckenridge, Chief of the Federal Hygienic Laboratories and President of the Allied Coalition (1980-1982), "that the parent bacteria of the plague were the bacillus Paratyphoid A and the bacillus Dysenteria; neither of which in their most virulent forms possessed a malignancy comparable to the new bacilli."

Of the devasting results of the planting of the Blue Plague cultures by agents of the Far East Entente in the water mains of the Caucasian cities on the night of May 7, 1979, six months after the opening of hostilities, there need be little said. In Los Angeles conditions were analogous to the depopulation of Budapest by the Black Death in 1348. That the Allies survived this gruesome blow was due chiefly to the heroic efforts of Dr. Breckenridge and the staff of the Federal Hygienic Laboratories in preparing vast quantities of vaccine for prophylactic inoculation.

What was at this time unsuspected by the populace, and it was fortunate for their peace of mind, was that Dr. Chang Lin was continuing his researches to produce the even more malevolent cross-bred bacillus of the Purple Plague. Logic pointed to Chang continuing his researches with such an end in view. Yet curiously, no hint of his work reached this country until the night of March 3, 1981.

Frantic ringing of his visiphone roused Dr. Breckenridge out of a sound sleep in the presidential suite of the Hygienic Laboratories. He switched on the light to see the haggard face of Inspector General Madison of the U. S. Intelligence Department staring at him from the visiphone shield.

"Very sorry to disturb you, doctor—we've just received a communication from No. 533 stationed in New Hankow," said the inspector. "And it's bad—I'll read it to you, decoded: 'Group of fifty French prisoners held in Sun Yat-Sen University laboratories. Dr. Chang Lin reported to have personally liberated vial into room. Prisoners within forty-eight hours developed fever accompanied by purplish rash. Delirium and respiratory spasms preceded slowing of pulse and stiffening of bodies. Bodies of twenty held for autopsy very purplish, muscles contracted and knotted in throat. Experiment very closely guarded. Unable to learn details.'"

BRECKENRIDGE reared up from his bed, his heavy jowls sagging and his hard blue eyes reflecting some of the inspector's terror. "Respiratory spasms—purplish—Dr. Chang Lin," he whispered disjointedly. Then his wide mouth set aggressively as he stared back into the shield. "You're positive that's authentic?"

"Absolutely—No. 533 is one of the most dependable men in the service."

"It's probably true enough—should have been expecting it! But God in Heaven—it's ghastly! And at a time like this it would mean—no use thinking of that now. We've got to get some of those cultures, immediately!"

The inspector slowly shook his head. He seemed an old, old man in that moment. "I can't promise," he whispered, the unwilling confession wrenched from his lips.

"We've got to have them!" repeated Breckenridge. He scratched his bald dome of a head, his blue eyes hard as tempered steel. "Does this 533 know anything of Bacteriology?"

"Very little, I'm afraid."

"Can you get one of my men into New Hankow?"

"Possibly."

The doctor's brows knitted fiercely. "I think I know the man," he muttered to himself. "I think—" He glared into the shield. "Have your plastic surgeons on duty within an hour. And send a guarded tube car over at once!" Breckenridge switched off the phone.

Leaping from the bed he threw a dressing robe about his big, fleshy body and strode to the heavy door opening into the hall of the Hygienic Building. Two heavily armed sentries saluted smartly and fell into step behind him. At a door at the farther end of the hall, the doctor pressed an entry button. A shutter in the door slid up and a light shone in his face. Faintly, a bell tinkled from inside the room.

"What you want—come in!" a drowsy voice called out of the tubular shaft beneath the button.

The sentries came to attention on either side the doorway. Breckenridge entered and carefully closed the door behind him. "Morning, McCarthy," he growled, coming to a stop in the center of the room.

McCarthy, head of the toxin research and Breckenridge's second ranking assistant, eased himself up to a sitting position against the head of the bed. He stifled a yawn, as he caught the stern set of the doctor's jaw. "What the devil's happened?"

"Plenty," grunted Breckenridge. "How many years did you spend at the University of Sun Yat-Sen?"

"Three and a half," said McCarthy. He slid out of bed, bending forward to hide a puzzled frown. Could the long hours over the Milliscope have addled Breckenridge's head? He looked queer. McCarthy pulled on his pants in an instinctive urge to meet the emergency at least half clothed. People unfamiliar with him found it hard to believe that this slender, dark eyed man could be head of a department. Most of Breckenridge's associates were mature scientists. McCarthy gave an impression of being scarcely more than a student. "Then I also did about six months of research in New Hankow, afterwards," he added.

"Speak Chinese fairly well?"

"I got by all right. Especially, in the new revised language." McCarthy's frown lifted. Breckenridge was sane enough.

The latter rested his hand on his bald dome, stared fixedly at the younger man while he recounted the message visiphoned in by the inspector general. "You see," Breckenridge finished, "we've got to get a man in there who'll know his way about—someone that'll recognize the cultures when he sees them."

"Meaning me?" said McCarthy quietly.

Breckenridge slowly nodded his head, the heavy load of his responsibilities momentarily betraying themselves in his harried eyes. "Meaning you," he said. "I hate to ask it, McCarthy—you know what it means. The Blue Plague—we went through that together! But this thing—well, you're built for the job. You're the only man I'd trust to put it over. That's why I'm not just asking you—I'm ordering you—no, blast it, I'm begging you!"

McCarthy shrugged. "Sure, Tom, that's all right. I'll go. But I don't look much like a Chink. You think I've got a chance?"

Breckenridge nodded again. "The inspector will take care of that end of it. Get you into New Hankow. And if necessary to get the cultures out, we'll send the left wing of the air corps in as close to the University as we can. I can't do any more."

"We'll hope that's aplenty," said McCarthy.

His dark eyes looked deep into Breckenridge's blue ones. They understood each other perfectly, these two. Almost like father and son. They clasped hands.

"It's up to you," the older man said, his deep voice strangely gentle. A gong sounded from out in the hall. He squared his fleshy shoulders. "Aw—hell, what's getting into me. That's the tube car now. Well, see you again sometime!" He strode over to yank open the door, dressing robe flapping about his naked shins. The sentries snapped to attention. The door slammed shut.

MC CARTHY dressed hurriedly, his lean face thoughtful. He looked older now. Nor did he have any misapprehensions concerning the task before him. The possibility of gaining entrance, much less of escaping alive from the guarded walls of Sun Yat-Sen University, he knew, were infinitely slim. Yet he managed a grim smile as he left his room to step out into the hallway.

An elderly army officer wearing the gold oak leaves of a major on his shoulder loops was waiting outside his door. The major saluted. McCarthy's hand snapped up to his visor. They walked together to the end of the hall. Sentries opened the door and stood at attention. Just outside it were several squat armored tube cars. The major led the way to the center car. An engine murmured softly. Then they were shooting away through the night.

The inspector general met them at the entrance of the Service Building. He dismissed the major, then turned, his steel gray eyes probing McCarthy's seemingly

unconcerned countenance. "You're the man Dr. Breckenridge is sending?" he asked sharply, faint disappointment creeping into his clipped speech.

McCarthy smiled. "I'm it," he said.

"You're a bit younger than I had expected you to be," admitted the inspector.

McCarthy still smiled, but his gaze as his dark eyes clashed with the inspector's was strangely melancholy. "But not too young," he said quietly.

The inspector cleared his throat uneasily. "Are you ready for the operation?"

"Operation? I thought——"

"It's not that bad. We're merely going to make a Chinaman out of you."

"Oh, is that all," McCarthy had an intuitive feeling that it would be plenty. He accompanied the inspector to the third floor of the building. They entered a long white walled room fully equipped with the latest surgical apparatus. Two surgeons, dressed to perform an operation, were carefully adjusting a large ray-lamp that threw out a brilliant topaz shaft of light.

"Just how would you like to have your hairline?" asked one of them when they had been introduced.

McCarthy saw that he was deadly serious. His smile was a trifle weak. "You might make me as good looking as possible," he suggested.

"All right, doctor, we'll do that," the surgeon promised. "Now if you'll just step back this way."

McCarthy followed, unconsciously musing on how a steer must feel on being led to slaughter. An attendant helped undress him. They scrubbed him with a caustic smelling solution and brought him back to the operating table. One of the surgeons held out a mask. "You'll like this. It's cycloprópane. Ready—breathe deep." McCarthy heard him chuckle softly as his head dropped limply back on the table.

When he commenced coming around again, he saw that he was in a small cell-like room tinted a soothing, restful blue. Someone was standing beside his bed. As his brain cleared, he recognized the surgeon who had chuckled as he had gone under the anesthesia. "Hello—did you finally decide to wake up?" the latter chided. "You must be related to Rip Van Winkle. You know how long you've been snoozing here?"

McCarthy grinned feebly. His face felt strained, unnatural. "All of five or six hours?" he hazarded.

"All of forty-eight hours," the other corrected. "You'll feel your style a bit cramped here at first. A good meal won't hurt you. Your skin's tender just now. That won't last long."

The patient started to raise his hand to his face, stared hard at it. The skin was a pale yellow, the skin of an oriental. He looked up at the surgeon inquiringly.

"Rather neat, eh?" chuckled the latter. "You're the same shade all over. From toe nails to the insides of your ears."

"You mean it—will it come off?"

"Not for about six months. These Clinton lamps do a real job, burn the color into the pigmentation of the skin."

McCarthy sat up in the middle of the bed, possessed by a very natural desire to see what had been done to his face. The surgeon, reading his thought, obligingly handed him a mirror. McCarthy took it with a decided feeling of trepidation. What would he look like? They certainly hadn't been joking when they had said they were going to make a Chinaman out of him. He closed his eyes, opened them. At first glance he was almost inclined to believe that some weird hoax was being worked on him, that it was the features of another man he saw. He smiled, a queerly puckered smile. The face in the mirror smiled back at him.

The features were those of a rather intelligent looking young Chinaman, a rather handsome young man by most standards. Studying himself, McCarthy realized that the alchemy had been worked through slightly flattening his nose and tightening the skin above the corners of his eyes. His eyes, dark brown to start with, seemed blacker still and somehow inscrutable against a skin the same topaz shade as that of the hand which held the mirror. McCarthy was suddenly struck by the improvement of his hairline. His forehead was still high, but the deep V's which had formerly run back on either side his scalp lock were smoothed out in a less indented line. The hair itself was clipped short like a coolie's.

Certainly, there was very little about the face to suggest that of Dr. Breckenridge's second ranking assistant. McCarthy reached up to tenderly stroke his cheek. It felt as though it had been badly sunburned. He glanced up at the surgeon. "Not a bad job. But what's worrying me is this—can you make me back into the fellow by the name of McCarthy again?"

"Of course, Mr. Soo Yong. It's no trick at all."

"Soo Yong?"

"I forgot to tell you that's your name around here. I have to run along now. They'll have your breakfast here in a few minutes. When you've finished eating, we'll go down to the office of the inspector general. He's in a devilish hurry about something or other. Never saw him so worked up."

"You givee me plenty flood and some pants, I be with you," clucked Soo Yong. The change in the front which he presented to the world had brought an unconscious change to his point of view, an instinctive reaction to the part he was to play. His smile was slower, more enigmatic. His voice intoned with the lisping click peculiar to the Chinese.

"Me be backee in half an hour," grinned the surgeon as he turned toward the door.

An attendant, whom Soo Yong recognized as the man who had helped undress him in the operating room, brought in food and clothing. Soo could not help noticing the furtive manner in which the latter shuttled through the door so that there was no opportunity for anyone in the hallway to even steal a glimpse into the room. When he had finished eating and dressing in clothes such as would be worn by a Chinese student in an American university, the attendant handed him thick lensed glasses and a curious rubber-like parchment of a translucent, yellowish color. "What kind of a device is this?" he asked, examining it curiously.

The attendant took the parchment, laid it over Soo's chin and pressed it against his cheeks. Soo turned to look in the mirror. His jowls were full and baggy, changing the cast of his whole face.

"So that's it? A chin mask. I've heard of them. Is my name changed, too?"

"No, you're still Soo Yong," said the attendant. "Orders are very strict. No one, other than the inspector general, Dr. Wilkins and myself, is to see you with the mask and glasses off. You want to keep your hat on most of the time, too. What we can do, the Entente can also do. We suspect very strongly that they have agents here in the Service Building. We know for cer-

tain that one of our men was detected in New Hankow through a dot picture taken of him leaving General Timken's office."

"Isn't that a cheerful prospect?" said Soo Yong with an ironic shrug.

"Very," said the attendant drily.

DR. WILKINS returned presently to escort Soo down to the office of the Inspector General. The latter dismissed his secretary and turned to the surgeon. "Soo Yong and I will be busy for a while," he said. "I wish you would give No. 840, just back from Benares, another ray treatment and touch up his brows a bit." Soo slipped off his chin mask as the surgeon left the room. The inspector nodded curtly. "You look better than I had expected you to," he admitted begrudgingly. He held out a plain silver band ring.

"This is made of a lead, cadmium alloy and has an elasticity nearly equal to that of rubber. By pressing it flat in this manner, the numbers otherwise indistinguishable on its face are readily seen."

"2000 L—V," read Soo Yong.

"That is your number. It is to be used in all communications with this office and the operatives under you. The ciphers denote your rank. And I will be frank with you to say, that it was only through Dr. Breckenridge's insistence that you were given this rank. Orders have been issued placing you in complete command of the Espionage Department in New Hankow, for the period of this emergency. I trust you will not abuse this authority."

Soo regarded the Inspector impassively. "I am not in the habit of abusing my authority," he said quietly. "I trust that the Inspector is aware that as Dr. Breckenridge's second ranking assistant I also hold the rank of Lieutenant General?"

"I—I really, doctor, did not mean it that way," said the Inspector in hasty apology. "You must understand that it is hard for an old army man like myself to keep in mind that Dr. Breckenridge as president of the Coalition is also Commander-in-Chief of the Caucasian Allies? You, yourself are an extremely young man to hold such high rank. The situation is unprecedented."

"I can understand," agreed the spy.

The Inspector seated himself at his desk and pulled back a chair for Soo Yong. "The conditions in New Hankow are briefly this," he said, spreading a map of the city. "Being familiar with the University of Sun Yat-Sen you will remember that it is surrounded by a high wall. This is at present closely guarded. Since you were there, however, a second higher wall has been built inside the grounds to inclose Dr. Chang Lin's laboratory and some twenty acres of ground whereon are housed the animals and patients used in his experiments.

"Gaining access to this latter is practically impossible for anyone other than one of Chang's carefully chosen assistants. One of our best operatives tried it several months ago. We have never heard from him since. No. 533 has managed to pass himself off as a Japanese student of Aeronautics and we have another man working in Dr. Chang's home as an assistant houseman.

"I have suggested to Dr. Breckenridge that we endeavor to place you as a fellow servant to this latter operative; since Chang's home is in a building adjoining the laboratory."

"That's agreeable with me. I should make a good servant," said Soo.

"You will need to be. Your success, and your very life for that matter, will depend upon your own discretion. Once you have obtained the cultures you will pass them on to No. 548, the assistant houseman. He will turn them over to No. 533, who will smuggle them out of the University to our department headquarters in New Hankow. If our present system is not disrupted, they should come through our lines from there without mishap.

"As for reaching New Hankow, that in itself is not so easy. The sky above the city is constantly patrolled by their machines. Our own aerocopters, since the introduction of audio finders on antiaircraft guns, can only cross the lines at very high altitudes. Of course, they can glide down into enemy territory without being picked up by the audio stations, but unfortunately, the moment they turn on their motors to rise, their presence is detected and the vicinity in which they landed is subject to an intensive search for any passengers which they may have unloaded.

"For this reason you will be landed near Tungchang and must depend upon your own resources to locate No. 1195, known as Towan Nung and the proprietor of a small foundry at Lee and Canton streets in the north outskirts of the city. He will assist you in your rôle as a refugee from the Hangchau district, recently occupied by our troops, and see that you obtain transportation on the K. K. into New Hankow.

"Arrangements have been made for you to leave here this afternoon in an aerocopter racer. At the west coast this will be joined by a squadron of Midget destroyers to guard against any possible attack by Entente cruiser planes while crossing the Pacific. If all goes well you should arrive back of our lines tomorrow morning and will be taken across the lines in a moth wing bi-copter the following night.

"You may, if you wish, carry a gas gun until you get in touch with Towan Nung. After that, inasmuch as you will be stripped and subject to a rigorous examination before being granted admittance to the University, the possession of a weapon of any sort would be inadvisable."

"I'll take my chances bare-handed from the start," said Soo. "Now if I could make a few suggestions?"

"Certainly."

"For one thing, having spent some time in Shanghai I would prefer to pose as a refugee from there rather than from Hangchau. Another is, instead of being taken over the lines tomorrow night, I would rather spend a day or two in one of the suburbs of Shanghai familiarizing myself with the streets and people. One must have a birthplace, you know, and it might be well to be able to describe it without hesitation."

"Not a bad idea," agreed the Inspector, glancing at the spy with new respect. "Say you take two days, eh? Fine. We've some little time before you leave, so let's spend it on maps, pass signs, and the like."

For the next three hours they occupied themselves in this manner, the inspector switching off his visiphone to insure them against interruptions. When they had finished, Soo Yong replaced his chin mask and glasses. The inspector escorted him out to a tube car. They saluted.

"Good luck," said the inspector.

"I'll probably need it," smiled Soo.

He stepped into the car. The patrol closed about it and they whisked through the crowded streets to the

Flight center. Here the spy was rushed over to a giant aerocopter racer that sat like a rocket on its starting pedestal, the twenty-foot blades at its point revolving slowly, catching the sunlight in a gleaming silver disk. Soo climbed up into the narrow, sound-proof cabin. Glancing out one of the small oval windows he could see helpers and pilots staring curiously over at the racer from the booths about the landing square.

Soo wondered if among them there were Asiatics molded in Caucasian guise, perhaps taking note of his departure. Common sense told him that such was likely the case. He nodded curtly to the pilot and his mate. The former reached out to grasp a small lever.

The great engine in the hull of the craft made a faint buzzing sound. The roar of the oscillatory propeller was buried by the cab's thick, insulated walls. They rose slowly from the ground, then climbed faster and faster into the blue vault of the sky. The city spread out beneath them. At ten thousand feet the pilot leveled off into the lane reserved for government traffic. The buzz of the motor grew shriller as they shot off toward the dim line of the western horizon.

At Los Angeles, with its many ghostly, empty buildings, mute reminders of the havoc wrought by the Blue Plague, they stopped at the War Terminal for dinner. When they took off again, twenty Midget destroyers swarmed up into the air about them, resembling in the fading twilight a swarm of gnats hovering around a monstrous beetle. The little crafts' propellers, for that matter, stood out on either side of their metallic blue tubes of bodies, much like the wings of gnats. Each was manned by a single pilot and carried a single gun, an automatic uranium bomb gun, the muzzle of which peeked from the pointed hull. Yet so great was their speed, in the neighborhood of nine hundred miles an hour and so devastating their uranium bombs, that the largest cruiser planes were helpless when attacked by a fleet of them.

As the aerocopter gained the level of the government lane again, Soo Yong looked vainly around in search of them. All but two of the squadron had disappeared. Then he noticed that the pilot's mate was giving orders into his radio sender. From them, Soo gathered that the leading Midget was flying fifty miles in advance of the aerocopter.

It was still light up at this level. Slowly, very slowly, the sky darkened ahead of them as they sped in the wake of the setting sun.

AT a somewhat later hour, three nights later, Soo was again in the air. He had been busy during the intervening days moving furtively among the frightened townsmen of Shanghai. The city had suffered at the hands of the invaders, even as those European cities which had felt the fangs of the Entente during the early months of the war. Soo Yong was a little sick at the picture of death and privation stamped on his memory. During the hand-to-hand fighting in the vicinity of the city both sides had used their Dessermer wave machines almost constantly. The regular troops equipped with ear-pads had not suffered greatly. But the millions of Shanghai were, almost to a man, stone deaf.

This night, Soo Yong was riding in a Moth, as the moth wing bi-copters were commonly called. It was a machine very much on the order of the Midget destroyer, but built large enough to accommodate a passenger as well as pilot and having considerably longer propeller blades. Soo had discarded his suit for the ragged clothing of a coolie refugee. For the time being this was hidden beneath a heavy coat and a cowl-like head covering.

The pilot, a tubby young man with small blue eyes set back of nearly colorless lashes, was turning more oxygen into the cab; one eye intently studying the altitude meter, the needle of which trembled giddily at 20,000 feet.

"This ought to be about high enough to get us out of range of those blasted audio finders," he grunted presently. He pushed a lever and the cab tilted slightly. "If I don't get lost now, or freeze a feed line, or run into a chink patrol, we'll soon be getting over no-man's-land."

A cheerful fellow, thought Soo. "You think you'll be able to find Tungchang?" he asked.

"Aw—that's easy. This little radiocompass does that." The pilot tapped a lighted map on the dashboard. "It's tuned in on a couple of stations back of the lines, those two green dots. That red dot shows where we are relative to them and to China. What's hard is when I have to glide down with the engines dead and pick out a certain spot using their sending stations to find it. The last time I was over I nearly settled down on a gun nest. Had to scoot around through the tree tops to make my get-away."

The spy was silent, watching the red dot that floated slowly across the dashboard map to a point he knew to be the little city of Tungchang. It was perhaps fifteen minutes before they were directly over it. The pilot switched off his engines. Slowly the Moth sank, suspended on its autogiro propellers.

Soo gazed down through the floor window. The pilot studied the myriad instruments on his dashboard. "We're down to 5,000 feet," he said some time later. "Tell me if you see a bunch of lights. I'm going to slow her up a bit."

They floated gently on down for another thousand feet before Soo noticed anything that might indicate a world was beneath them. They had just dropped through a bank of clouds. Through the blackness beneath them a beam of light shot like a falling meteorite toward the west. A moment later another beam came from the opposite direction and along the identical course. Soo called the pilot's attention to it.

"Yaw—I saw them myself. They're trains on the K. K. monorail. The chinks keep the road hot these days. See that beacon to the north? I think that's Tungchang. We'll have to angle over to the right a trifle. There's a lot of luck in this business. Still, I don't envy you your job. Guess you know what they do to you boys if they catch you?"

Soo Yong shivered in spite of himself. "Say, what did you do before the war?" he asked irritably.

"Me? I was a flunky in a morgue in Los Angeles."

"That accounts for it."

"Accounts for what?"

Soo Yong didn't reply. He stared moodily down through the floor window. The pilot fingered his controls as the flat face of a small field rose up to meet them. The Moth settled down lightly to the damp earth. Soo slipped off his coat, started to take off his chin mask and glasses, then thought better of it. He dropped through the door to the ground, saw that he was in a rice field.

"Well, so long, friend," whispered the pilot. "Hope I see you alive again. I'll stay here long as I can to give you a start. But I'm afraid that won't be long. These chinks are deucedly curious."

"Thanks. I'll be off."

Soo darted away across the rice field toward the shadows of what appeared to be a small orchard. Dew on the rice drenched his silken pants legs. He felt strangely elated, now that he was actually in enemy territory. It was a relief to have his feet on solid earth again and to be away from the grim sympathy of the pilot. Soo climbed through a fence, jumped a narrow ditch, and set off through the deeper shadows of the orchard.

His safety, he knew, depended upon getting as far away as possible before the bi-copter was discovered. A few scattered lights told him that the farms here were small, scarcely more than large gardens. Someone was certain to have heard the swish of the autogiro blades as the Moth landed. Soo came to a narrow road and turned down it in the direction of Tungchang. Before he had taken a dozen strides he heard the roar of the *Moth's* propeller. It rose rapidly into the murky sky.

"Blast it—he didn't hang around long," muttered the spy. "If those helicopter field lamps are going to be on the job within five minutes, I'd better be finding me a hole to crawl into!"

He glanced back apprehensively over his shoulder as he raced down the road. Abruptly, a siren commenced shrieking from across the fields to his left. Soo came to a panting stop as lights flashed on in the road ahead of him, leaped over into a ditch. Then he saw that it was only a lighted window, that the road turned to the north. He climbed under a concrete fence and trotted down the rows of another orchard.

Before he reached the end of it along a course paralleling the road, he heard the deafening buzz of an approaching helicopter, evidently coming from the nearest audio station.

Looking back, he saw the dazzling white cone of a field light suspended in the air. Slowly it circled the rice field where the *Moth* had landed. A few seconds later another one joined it. Like circling hawks the helicopters swept in wider and wider circles. By the reflected light of their field lamps, Soo Yong could see that he was in a newly leafed plum orchard. Anyone passing along the road was liable to see him now. He climbed hastily up into one of the trees.

Half a minute later the bright white shaft of a field lamp was probing the shadows of the orchard. Soo held his breath as he peered up through the leaves. The helicopter seemed to pause above him, then moved on again. From the road a broad, thin beam of bluish light shot through the orchard. Soo jerked up his foot with frantic haste as it caught one of his toes. That would be a fan lamp on a tube car. It had got here sooner than he had expected.

He heard voices talking excitedly. Then the car moved on down the highway and the orchard was again in darkness. The spy started to climb down out of the tree, and paused, warned by some sixth sense. In the same breath the light flashed back on again. Soo waited a full minute after it had blinked off, before he left his roost. Sighting down a row of the orchard he could see the bluish blade of the fan lamp moving on toward the rice field. Crouching, he scudded over to the nearest fence, dropped flat on his stomach as a group of men passed down the highway.

BEYOND what appeared to be another field of rice he could see the feeble glow of several small campfires. Ragged silhouettes moved wearily between him and the flames with the sodden stride of exhausted men roused out of a dead sleep. Soo Yong recognized them as refugees.

He puckered his lips musingly. If there were only some way in which he could join them without arousing their suspicions? They, doubtless, would be going on into Tungchang with the morning. With them he would escape the searching scrutiny which would be his lot as a lone traveler on his way to the city. Soo nodded his head decisively. His whole mission was a gamble anyhow. He climbed through the fence, and bent half double, stole up the ditch running through the intervening field. On hands and knees he crept up to the edge of the camp. From the other side of a low hedge he could hear drowsy, grumbling voices.

Soo bent down wringing the dew from his pant legs. A rapidly brightening light warned him of an approaching helicopter. "At least—I'm close enough to the camp to be taken for a refugee," he thought.

He straightened to stare boldly up into the white cone of the field lamp, rubbing his eyes sleepily. Suddenly he became conscious of a tall, gaunt figure on the other side of the hedge. The refugee was watching him suspiciously. Soo stared down at the ground, wondering whether he should run for it the moment the light passed, or attempt to work his way into the man's confidence. The helicopter hovered over the camp, its pilot apparently counting the sprawled figures and their few bundled belongings.

While Soo still debated with himself, his restless gaze was attracted by something which had apparently been thrust hastily beneath the bushy spines of the thistle brushing his leg. Pushing the spines aside with his toe, he saw a handful of carrot tops and the entrails of a chicken. A speculative gleam played in his dark eyes. Soo smiled slyly to himself as he stepped through a gap in the hedge to confront the man beside the fire.

The refugee's family lay in a huddle of dirty blanket, the mother snoring lustily. The spy saw that the man had only one eye, but this good orb regarded him with unblinking suspicion. "I have slept long," he complained before the other had a chance to speak. "And my stomach is tied in knots."

"Where do you come from, stranger? I think we should see the marching commander," said the refugee, running him through with his good eye.

Soo stepped close to the fire to spread his slender fingers over the dying embers. "And why should we do that, oh fellow sufferer?" he asked.

The refugee squinted ponderingly up at the wheeling light of the helicopter, then back down at the spy's squatted figure. "You heard the siren and saw the field lamps? The tube car officer says there is an enemy special running loose around here. How should I know that you are not he? We go to see the marching commander!" The man's claw of a hand dropped purposefully to the pearl hilt of the knife protruding from his belt.

Soo continued to warm his hands. "A curse on the siren!" he grunted. "To wake a man from blessed sleep. My misfortune—that I could not have waked sooner!" He rose suddenly to lean close to the refugee. "So that I might have eaten some of that good chicken and carrot soup your wife was cooking."

The man cringed back from him, lips curling in a snarl of terror. "You know that?" he whispered hoarsely. "My wife, my children, they starve!"

The man must indeed have been desperate, thought Soo Yong, to have broken the recent Entente edict forbidding refugees any food other than that issued at the feeding stations along their line of march. With millions of refugees living off of the country as they fled north from the advance of the American and Canadian forces along the Hangchau and Shanghai fronts, Li Chi-Shen, Chinese Minister of the Interior, had been forced to impose the death penalty to stop their looting.

"To find food for his family is the duty of the husband," said Soo Yong soberly. "Who can say that I, too, have not pulled the forbidden carrot? Yesterday, on the march from Paiho, I was taken sick with weakness. All afternoon I lay in the field beyond the hedge. Then when I saw that you had food, I thought to wait until you had cooked it before I joined you. But in my weakness I fell asleep again, not to awake until I hear that thrice cursed siren."

"This God forbidden war, when will it end!" groaned the refugee. He scowled down at his wife's gaping moon of a face as though he held her in some way responsible for his plight. Then he squatted beside the spy who was again leaning over the fire's dim coals. "You had best not let any of these sneaking specials see you tonight. With your company already departed you might have difficulty in proving your identity."

"But I have been here all afternoon."

"Yet you say you were asleep?"

Soo Yong half rose to his feet. "I had not thought of that!"

The refugee clawed his chin agitatedly, his good eye rolling like a bead on a twisted string. He kicked the butt of a stick into the fire. "Woe to you, if they catch you," he muttered. Soo had a lively suspicion that the man's concern had to do chiefly with the discovery of his own thieving. He gazed sadly into the fire waiting for the other to continue. The refugee wagged his head. "It is a risk—yet I will do it because I like you, my friend," he mumbled. "We suffer much these days. I shall tell the marching commander your story. Even more, I shall tell him that we are cousins of the blood. By any chance are you from Shanghai?"

Soo Yong's face lighted. "My honorable family are of the little perfume shop at the Locus and the Plum. The house of Soo Ling. You know the place?"

"Many is the happy time I have been past there," said the refugee mournfully. "I am of the family of Shen Mok at the Nag and the Lily. But wait for me here. I go to speak with the marching commander who was my gracious employer in those golden days."

When he had shuffled off toward the center of the camp, Soo Yong stretched himself out in the cloaking shadows of the hedge, pillowing his head on his wrist and pretending to sleep as he gazed after the refugee. Seeing that Shen returned alone, he relaxed, breathed more heavily.

"The matter is righted, my friend," said the refugee. Then seeing that the spy was asleep, grunted morosely. "Careless fool that I am to get caught at my stealing!" He stood staring pensively out across the camp for a while, then lay down beside his wife, his gaunt body shivering as the foggy chill of the night bit through his worn clothes.

Before dawn the camp was astir, eager to finish the three mile journey on into Tungchang, where they would receive their scanty rations. Children wailed hungrily above the scolding, disheartened clatter of the women, as the latter shouldered their numerous burdens. The marching commander, a venerable, tired-eyed old Mongol, with thin trailing mustache, gave a sharp order. The refugees fell into line to resume their trek.

Soo Yong carried one of Shen's blanket rolls, resting the stooped shoulders of one of Shen's small daughters. No one paid him any particular attention, accepting him on the word of the family he accompanied. They were too tired, too sore and hungry for anything other than the ceaseless shuffling march. When another line of refugees joined them on the highway, Soo felt that his safety was assured.

The sun climbing up into the pale morning sky showed him the pyramidal buildings of Tungchang reared up beyond a patchwork of small, well cultivated fields. The refugees made pitifully slow progress. An hour or more dragged past before they reached the outskirts of the city. Soo was staring curiously over at the walled fronts of the houses lining the sidewalk along which they trudged, when Shen fell back beside him.

"You see him with the one arm who talks with the marching commander?" Shen's whisper carried a note of warning. Soo leaned out of line to spot a short, rotund, little refugee who gave an impression of being altogether too well fed to have spent the night without his supper. Nor could Soo recall having previously seen him in the line.

"You think him a special?"

"He has the sneaking look, all right! I know them—with their crippled legs and arms. Army officers who have been wounded at the front. Fat, bigoted fellows—some day I shall slip my knife into one of them!"

Shen, the spy reflected, would make an easy disciple to banditry. Soo smiled grimly to himself as he watched the cripple drop down the line until abreast of him. "I wonder if they will give us more than a chin of rice this morning?" he complained. He had learned from the refugees that this was the customary ration. "My weakness ties weights upon my weary feet."

"When did you last eat, oh companion in hunger?" asked the cripple. His slant eyes searched Soo Yong's begrimed face.

"It seems a century ago," groaned Soo, and was silent.

THEY plodded on into the business district of Tungchang before the cripple commenced talking garrulously in an adroit endeavor to learn the spy's home and his destination. Soo remained glum. He had little doubt now that the man was a special. Time and again he could feel the cripple's sharp eyes studying him covertly as he made some mumbling indefinite reply to a frankly probing question. Nor were Shen's vehement remarks helping matters any.

As they came up to the long line formed in front of the Municipal center awaiting rations, the cripple no longer left any doubt as to his status. He opened his blouse to show the small bronze disk of the Entente intelligence service. "I must trouble you, Soo Yong, to accompany me," he said shortly. His hand dropped to the smooth butt of a gas gun which had suddenly appeared in his belt. "There are questions which the Chief of Specials would like to ask you. If you can answer them satisfactorily, you will be given a good meal for your trouble."

"A good meal?" said Soo hungrily. "For such a reward I would brave a den of lions!" He nodded reassuringly to Shen, whose good eye glowered menacingly at the special's fat stomach.

The latter appeared to be on the point of changing his mind, rocked on his toes, then grunted half to himself: "I must take no chances." He motioned on down the street. "You will go first."

Soo handed his blanket roll to Shen's small daughter and left the motley procession of refugees to precede the special through a subway under the wide pavement to the less crowded sidewalk at the farther side. Townspeople, hurrying to their work, eyed them hostilely as though to inquire what business refugees had wandering about the city.

Soo Yong glanced back from the corner of his eye to find the special following him closely. The latter's black eyes bored into his shoulder blades. Soo was reminded of a ferret. Scant sympathy he could expect from such a man. Scant chance of escape. There was a ruthlessness, a fixedness of purpose in the special's plump face, that warned the spy against attempting to dodge into the open doorway of one of the shops, as he had first intended to do.

They rounded a corner and came opposite the Municipal Center Building. It was a beautifully designed piece of architecture covering an entire block. A one-story marble base with a row of tiny windows at the top of it ran back to a smaller two storied square. From the middle of this the Municipal Offices ran up in a graceful white tower for a full ten stories.

As they crossed through another subway to the front of it, Soo suddenly remembered his chin mask. His breath came in quick fearful gasps. If he were stripped and examined it was certain to be discovered. Explaining it would be next to impossible. To his narrowed eyes the marble front of the center was the wall of a prison from which he could never hope to emerge alive!

Terror claimed him momentarily. What was it the inspector general had said? That spies were left on the electric table until they were willing to talk. A feverish sweat came out on Soo Yong's brow. He fought down the temptation of trying to lose himself in the crowd. No use getting a bullet in his back. Perhaps inside the building. He drew a slow deep breath, sent a dull glance back at the little special.

The man motioned him to enter the high, ornate entrance of the Center. The cripple exhibited his disk to the sentry at the door. They passed into a long cool hallway. At this early hour it was practically deserted. To Soo it seemed like a passageway through a tomb.

"We turn into this corridor to the left," ordered the special.

A placard above it said: "For prisoners only."

The spy saw that the cripple was no longer clutching the butt of his gas gun, saw that the passageway was empty. His lean body tensed, relaxed again as a janitor stepped across the hall. The man must have just finished cleaning the room on the right. It would likely be empty. Soo's eyes were glittering slits.

Another stride and he would be in front of the door. He spun on his toe, silently, with the lightning speed of desperation. His slender fingers sank like talons in the special's windpipe. His other hand clutched at the gas gun. In the same flowing movement he flung the smaller man against the swinging door, carried him on through it into the empty room beyond.

The door swished shut behind them. The special fought with blind, unreasoning fury. His bullet head battered into Soo's chin, knocked off the chin mask. His beady slanted eyes fired with demoniac light. The sound of their scuffling feet was the only sound in the cell-like silence of the room. Soo's hand tore the gas gun from the other's frenzied grasp. He pressed the muzzle of it against the special's writhing lips. There was a splitting hissing sound as he pulled the trigger. The special slumped lifeless to the floor.

"You suspected too much, my friend," panted the spy. He thrust the gas gun into his waist band, covered the butt with the ragged front of his blouse. "It would never have done to let you spread the story. Lucky break for me—that you had only one arm."

Soo saw that he was in a courtroom. He grabbed the special by the shoulders and dragged the body across the room to roll it beneath a witness bench. As an afterthought he took the disk from the cripple's shirt and pinned it inside his own blouse. Carefully replacing the chin mask, he studied his reflection in the polished top of a table.

"Now, to find a man called Towan Nung who owns a small foundry at Lee and Canton streets," he muttered as he smoothed out his clothes.

He strode boldly out the door of the courtroom. The janitor was pushing a pulse bench down the passageway. He looked over his shoulder at the spy, then continued on his way with the bench, a device used in checking the subconscious reactions of prisoners. The sentries at the entrance of the center gave Soo no more than a casual glance. Their duty was to keep people out, not in, the center.

As he mingled with the hurrying citizenry that filled the sidewalks, Soo was painfully conscious that his ragged attire was attracting altogether too much attention. Refugees were not allowed to roam about aimlessly. The spy turned into a small shop to buy himself a workman's blouse and trousers.

Changing into them, he found that his presence in the streets no longer excited comment. From a study of maps the day previous, Soo was already familiar with the monocar system of Tungchang. He climbed up to the passenger platform some twenty feet above the street to wait for his car. It came presently, a car as large as an old-fashioned Pullman, gliding soundlessly along the steel rail from which it was suspended. The rail itself was held by giant pedestal-like supports placed at intervals of about a hundred and fifty feet.

Soo Yong paid his fare and sank into one of the deep comfortable seats. The news-reels usually showing at the front of the car, he noticed, had been discontinued. Probable through the stress of war times. A disk near the top of the car automatically flashed on the names of the streets as they were approached. When it showed "Lee," Soo left the monocar. He was now in the northern outskirts of the city. Inquiry at a fruit stand revealed that Canton Street was only two blocks away.

THE spy passed the foundry with scarcely more than an uninterested glance. Turning up Canton Street, he paused in the mouth of an alleyway back of it. Waiting to make certain that no one might have followed him, he picked his way across a lot covered with an assortment of junk to a door as the back of the foundry. At his knock, a full faced giant of a man flung open the door.

"I'm not hiring anybody today," he growled. Then

Soo dropped his hat and picked it up with thumb and little finger, the foundryman's expression changed. "Well, come on in, we'll find out what you can do," he added gruffly.

"You are Towan Nung, I believe?" said Soo recognizing the operative from the description which had been given him.

The foundryman nodded. "And you?"

Soo Yong removed his ring and pressed it to show his number.

"You got through—fine! Headquarters has been worried. Did you have much trouble?"

"There was a special insisted on taking me to the center." Soo handed the foundryman the bronze disk which he had taken from the cripple.

Nowan Nung examined it. "57 E-K-O," he read. "One-Arm Chao, himself! You were lucky to ever come through with that devil on your trail. I had a brush with him once myself." He led the way into a cubbyhole of an office. Climbing down through a trap door in the floor, Soo found himself in a spacious cellar fitted with a powerful radio sending and receiving set.

"There's a shower and bath in the other room," said Towan Nung. "I've got clothes and papers here that will fix you up as a buyer for a local retail company. From here on into New Hankow you should have no difficulty."

Stripping off his two suits of clothes and chin mask, Soo Yong took a shower and dressed in the suit which No. 1195 provided. When he had finished there was little about him to suggest the heavy jowled laborer who had stolen into the alley back of the foundry an hour before. Towan Nung gave him a roll of the new Entente currency and drove him to the Tungchang station of the K. K. in a small dilapidated tube car.

A passenger limited was not long in arriving. It was in many respects not unlike a chain of the monocars in which Soo had ridden out of the foundry. The cars were longer and better streamlined. Each had its own driving motor, although the whole train was operated by a single set of controls. The ends of the cars fitted snugly into each other so that from a distance the train resembled a long thin tube hung from a gleaming silver thread.

Soo Yong bought a New Hankow paper and, with a wave to Towan Nung, boarded the train. Having ridden on the limited in his student days, he knew that it would be about five hours before he reached New Hankow, a distance of some eleven hundred miles. Soo ate a hearty meal in the diner and devoted his time to reading the highly colored but purely fictitious accounts of recent Entente victories on the Eastern front.

Shortly before six o'clock war-time, the limited commenced climbing the gentle grade to the mountain valley occupied by New Hankow, the golden city and headquarters for the Far Eastern Entente. Founded in 1943 at the intersection of the K. K. transcontinental monorail with the Urga-Bangkok monorail, its growth had been phenomenal. From the beginning it had been laid out with great broad boulevards and pyramidal towers of buildings. A beautiful city fattening on the natural resources of all Asia. And now with Los Angeles' millions wiped out by the Blue Plague, it had stepped from second place to the largest city in the world.

At the side entrance of the monorail terminal built in the manner of a feudal Manchurian castle, Soo Yong found a stout little man dressed in the garb of a prosperous merchant, awaiting him as No. 1195 had promised. Word of his coming, Soo afterwards learned, had come through by the radio sender in the foundry basement, an instrument using waves of such low frequency, supposed to be impracticable for broadcasting, that it had not been picked up by the Entente detectors.

After a brief exchange of pass signs, the merchant took Soo by the arm and led him to a waiting tube car. Twenty minutes later they were seated in the office of the Good Will Employment Agency, in reality, headquarters for the American branch of the espionage service in New Hankow.

Ken Jin, the name which No. 500 was using, offered Soo a cigar and lighted one himself. "There are about a thousand different things we have to discuss this evening," he said, leaning back in his chair and putting his feet on the desk in a very uncelestial manner. "But before we start in I wish you'd tell me about how long it will take Dr. Chang Lin to get this plague ready for distribution."

Soo Yong rubbed reflectively at his chin. "That depends," he said finally. "Inasmuch as the cultures liberated by Dr. Chang Lin very evidently attacked the bronchial tissues, and since the air acted as a carrier, we suspect them of being related to the Bacillus Influenzae. On the other hand, the purplish rash and slowing pulse, accompanying the stiffening of the bodies, would suggest Cerebrospinal Meningitis. It is possible that Dr. Chang has combined these two bacilli. In such a case, the cultures would grow at a prodigious rate. Two weeks might be a safe guess for the time required to grow sufficient cultures for infection of the Allies."

Ken Jin took the cigar from his mouth to shake his head harassedly. "I doubt—that is a terrible short time for this sort of work," he muttered.

"However," continueed Soo, "Dr. Chang must first prepare huge quantities of antiserum for the protection of his countrymen as he did previous to the release of the Blue Plague. Otherwise, since we would be able to drop the cultures back of the Entente lines within a week after they were liberated aboard, this new scourge would doubtless wreak as great havoc on the Far East Entente as on the Caucasian Allies.

"The production of such a quantity of antibodies would formerly have taken at least six months. The usual procedure is to inject the dead cultures into the veins of a horse. When the animal has built up sufficient immunity against this toxin, live cultures are injected, the amount being increased with the animal's increasing immunization.

"The antibodies thus produced are removed from the blood of the horse and prepared as a serum. Recently, we have been able in as short a time as two months to produce serum to combat this type of bacilli. But the point is, we must have the cultures and be preparing serum at the same time as Dr. Chang in order to successfully fight the disease. A few weeks time may mean ten million lives! We should have the cultures today, tomorrow, within the week at least!"

"I'm afraid it can't be done," said Ken Jin despairingly.

"It has to be done!" Soo Yong's dark eyes were narrowed, his lean jaw set.

"I know—I know. But you haven't been here. You don't understand the situation. Even now we are not certain that we will be able to get you into Chang Lin's home. Three days ago it would have been comparatively easy. But since then, with this damned Dragon Brother-

hood trying to assassinate everyone, they put any newcomers to the University on the grill and watch them for a week afterwards. Old comers too, for that matter. Every servant's room in Chang's house is wired with a visicell."

"Dragon Brotherhood? This is the first time I'd heard of it."

"Well, you'll hear plenty form now on! Maybe you read about a student riot at Shanghai University back in 1976 protesting against Dr. Tsai Yong's speech at the Conference of Race Limitations. Remember?"

Soo nodded. "They jailed them, didn't they? Claimed that they were spreading communism, or something like that?"

"That's the crowd. Youngsters for the most part, making soap box talks in front of theatres against the hierarchy. They started out as an offshoot of the old protest against Fu Wang's destruction of the family as the unit of government. A throwback to Confucianism. There's not much doubt that Russia jumped at the chance to convert them to communism. Russia, of course, has been down on the hierarchy ever since Fu Wang established it in 1937 and booted all the Reds out of China.

"During the past two years the Brotherhood has been getting stronger and stronger. Hungry refugees make easy converts. The Entente has been going easy with them, not wanting to take a chance on dragging Russia into the war. They realize that they've got more than they can handle now. Last week, however, the Brotherhood pulled off some strikes up at the Singan beryllium mines. That started the ball rolling. Huang Hi, governor of Singan, had several of the ringleaders executed and got his own head sliced off two nights later.

"The Entente woke up to the fact all at once that the Dragons, as they call themselves, were planning to take advantage of the war unrest to overthrow the hierarchy the same as the Bolsheviks did the Romanoffs.

"They made a raid on the Brotherhood headquarters here in New Hankow four days ago and threw several hundred of the Dragons into jail. Court was held all night and ten of the prisoners were beheaded the following morning. Two nights ago General Kang Keun, home on a furlough, was stabbed to death in the Plum Blossom theatre. Last night, an attempt was made to assassinate Dr. Chang Lin. Several men participated in the plot and are known to still be inside the University walls. But that's all that is known.

"That's why you'll have a hard time getting past the examiners. Not only will you have to guard against suspicion as an agent but also as a member of the Brotherhood. No. 548, who works as Chang's assistant houseman under the name of Lung Hi, managed to tie the can on a houseboy stationed in the wing of the house occupied by Chang's daughter this afternoon. There's a vacancy there now, and we're hoping you'll qualify for it.

"I don't know—but there's just a bare possibility that you might be able to work through the daughter somehow. She goes with her father to the laboratory occasionally. Heaven knows, I don't see how you'll ever get inside it yourself. Even she couldn't help you much."

"I remember her," said Soo. "She used to walk about the campus with her father when I was a student there. A stringy little blue eyed girl, about thirteen or fourteen. Chang seemed to be all wrapped up in her after the English woman he married had died."

"Yes, he still dotes on the girl. I don't think she's been outside the University since the war broke out. And I'll wager he doesn't let her out of the house since the Dragons started sharp-shooting. But enough of this! We must spend the next half of the night going over your route here from Shanghai. I've a partial list of the questions asked previous applicants to the University. The examiners may ask them, and then again, since they're on the lookout for Brotherhood members, they may have an entirely new list."

Ken Jin went over to his safe to take out a large file of papers and booklets. "Lung Hi will be here early in the morning. He seems to think the best way of getting you through is to have you pose as his nephew, refugeed from Shanghai," he said.

"I've had some experience at this refugee business already," said Soo Yong. He shrugged as he leaned over to study the map which No. 500 was spreading out on the table.

Lung Hi arrived at the employment agency shortly after seven o'clock the following morning. He was a scrawny, rabbity looking little man with big ears, round eyes, and a receding nubbin of a chin. He gave an impression of being ready to jump at the slightest sound as he entered the agency office. Here his demeanor underwent a radical change. His scrawny body straightened and he spoke with an air of complete confidence.

"The head houseman has agreed to employ you," he said to Soo Yong. "I'm to take you to the examiners. Devil help us, if you make a slip."

"I'm only human," protested Soo. The smooth oval of his face reflected a serious thoughtfulness quite out of keeping with his shabby, ill-fitting clothes. "Yet if I should fail you—let us hope that I roast until my skin peels on the electric table."

Lung Hi regarded him unblinkingly, even sternly. "For once," he said quietly, and deliberately, "Headquarters has sent a man I am glad to work with." No mean compliment this. For Guido Geiger, No. 548, was credited with being the craftiest operative in Asia. He dropped into his frightened, furtive pose again. "Come—we must hurry."

They rode in a monocar above the busy streets of New Hankow until finally leaving the far-flung suburbs of the city they came to a great gray wall, a mile square, its top covered with a cobweb-like canopy of gleaming silver wires. Level fields stretched away from it on all sides, giving no hint of the hundreds of buried gun placements and connecting passageways that undermined the verdant carpet of growing crops.

Leaving the monocar at the high arched entrance of the University, the two agents mingled in the crowd of students and workers that pressed toward the open gates. Drab uniformed guards stood at attention on either side of the deep vestibule. Soo saw that the crowd was splitting up into two lines. Lung Hi motioned him to fall into one made up of workers. As they approached the door at the rear of the vestibule, he found that each man was being painstakingly searched and questioned. Lung Hi stepped over to the sergeant in charge of the guards and glibly explained that he was bringing a new servant for the house of Dr. Chang Lin.

A guard was delegated to take them through a side door and accompany them to the hall of Examiners. Here, Lung Hi was told to remain in a waiting room while Soo was stripped and led naked as the day he was born into a larger room where four elderly, professorial looking men were seated around a low table. Soo was

directed to sit on a short bench. An attendant strapped light canvas cuffs about his wrists from which wires ran to a pulse machine, the face of which was built into the top of the examiners' table.

The pulse machine in operation was simple. Originally designed for testing the reactions of criminals to questioning, its sensitive gage showed the man's true feelings. Soo Yong, knowing that he was to be tested with it, was in a way prepared. His concentration was such that during the night past, he had in his mind's eye actually lived his supposed journey from Shanghai. It was in a way self-hypnotism similar to that of actors who play a masterful role. Soo Yong, as he sat there, was very nearly the illiterate coolie he pretended to be.

"You are Soo Yong of the house of Soo Ling at the Locus and the Plum, Shanghai; nephew of Lung Hi, assistant houseman in the home of Dr. Chang Lin, and have been recommended by the Good Will Employment Agency?" droned the head examiner, reading from a paper that lay on the table in front of him.

"I am Soo Yong, and the honorable paper is correct," said the applicant.

"You are a refugee from Shanghai?"

"By the way of Paiho Road, your Honor."

"You wish to work in the house of Dr. Chang Lin?"

"I do, your Honor."

The examiners consulted together for a moment, then proceeded to ply the applicant with a multitude of questions regarding his education, his family, and his reasons for fleeing from Shanghai. They watched him closely as he answered, studying his bland face for any sign of hesitation and at the same time checking his reactions by the wavering needle of the pulse machine.

Most of the questions, Soo Yong could answer readily enough. He made no atempt at guessing, knowing that the pulse gage would betray him. After all, a common coolie was not supposed to know a great deal. Soo felt that he had acquitted himself quite creditably, until the head examiner shot at him abruptly:

"You say that you stopped at the town of Paiho, eating refugee rations there for three days. Who was the gracious mayor of this town?"

It was a question which Soo realized he should be able to answer. It was customary for the refugees to give profuse thanks in the name of the mayor when receiving their chin of rice at the city center. The applicant hesitated, debated venturing a guess. "I do not know, your Honor," he said at last.

The examiners exchanged knowing glances. For a moment it seemed to Soo Yong that there was a terrible tenseness, a breathless silence in the room. He wondered fearfully what the pulse machine could have told. Then the head examiner muttered disgruntledly: "Stupid fool—good only for a servant." The other three nodded agreement. Soo dared not draw a deep relaxing breath. He must continue being Soo Yong the fool, until the pulse bands were unstrapped from his wrists.

When the attendant at a sign from the head examiner had taken them off, Soo was told to come up to the table. One of the examiners took a queer stamp with small needle points set in the face of it. Before the spy had time to brace himself, the man slapped the needles into his left shoulder. As he jumped, another of the examiners handed him a small badge.

"No. 7725—mark of Dr. Chang Lin, on point of left shoulder blade," the latter droned to the clerk.

"Bring in the next man," the head examiner ordered.

Soo Yong, after clothing himself, was led from the room. Lung Hi waited for him outside the door, his pinched face inscrutable. Leaving the hall of Examiners, they crossed a small, beautifully landscaped park to step on one of the sliding walks, a clever arrangement of endless belts used to hurry the students from one end to the other of the far-flung campus.

"You had no trouble, my nephew?" asked Lung Hi when the walk had carried them out of earshot of a group of stundents arguing noisily about a bulletin board.

Soo described his failure to answer the last question asked him. Lung Hi rolled his tongue in his sunken cheek. "One can never know what those cursed pulse machines have told," he muttered. "It might be that they hope to catch us all through following you. Not likely, though. Even so, there will probably be a special watching you for a day or two. Everyone's scared of their shadows since the Dragons have broken loose.

"As soon as the excitement dies down you'll have a better chance of getting into the laboratory. How you will work it then, I don't know. In the three years that I have been here, I've never had an opportunity to look through its doors but twice. To have tried to enter them, would have meant a quick trip to the beheader."

"Chance may present an opportunity," said Soo hopefully.

"Perhaps," agreed Lung Hi. From his tone it was plain that he did not place any great faith in such a fickle goddess.

THE walk had carried them by this time past the twenty or more huge buildings comprising the University of Sun Yat-Sen. Ahead of them there loomed up the thick walls about Dr. Chang Lin's laboratories. These lay in a rectangle covering some twenty acres and were several feet higher than the outside walls about the campus. The only entrance at the front of them appeared to be a small door directly in line with the sliding walk.

To the right of the laboratories was a large house built in replica of the famous Wu Men, south gate to the forbidden city, Peking. Its lang, or substructure, rose in a blank wall pierced by a few small doors for some fifteen feet above the green lawn of the campus. On top of this was built the house proper, a two-story structure with open galleries running across the front of it, the projecting roofs, with their corners turned up like a Turk's shoe, sitting on a row of small colonnades.

The upper two stories were in reality three separate buildings, the larger one in the middle being connected by short hallways with the smaller ones on either side of it. The house, Soo Yong remembered, had been erected especially for Dr. Chang Lin when the latter had been elected Lord Ruler of the University in 1966.

Lung Hi led the way down a narrow walk, which brought them to a wide door in the side of the substructure, which doorway was obviously the servants' entrance. Opening it with a pass key, they continued on into a high-ceilinged passageway, which, judging from the odor lingering in it, must connect with the kitchen. Lung Hi turned out of the passageway to climb a long flight of stairs. A small office-like room was at the head of them.

"We will wait here for the honorable head houseman," said No. 548, seating himself on the edge of a chair.

Soo stepped over to gaze out the small window. He drew a quick breath of appreciation at the beauty of the long court that lay beneath him. The placid face of a fish pond reflected the serulean blue of the sky. Bamboos towered in graceful curtains against the surrounding walls. A rustic, moon arched bridge spanned the end of the pond, its connecting paths running through vivid masses of flowers that bordered the banks and tunneling through shell-pink mounds of Japanese plum.

Looking down at such a jewel-like setting, it was easy to forget that the world outside was in the clutches of pestilence and war; that the very owner of this miniature paradise was the scourge of three continents.

Soo Yong was startled out of his revery by a low click from Lung Hi and the arrival a second later of a stout, full cheeked, rather fierce looking old man who might have been a modern version of a second century Manchurian warrior. Soo bent in a sweeping obeisance.

"Tsin Chan—this is my refugee nephew, Soo Yong, of whom I spoke this morning," said Lung Hi rising quickly to his feet.

The head houseman regarded the spy fiercely for a moment. Then his stern mouth fashioned a brief smile. "It is well to have men one can trust in these troubled days," he said in deep rolling voice. "I am glad, Soo Yong, to have you in the worthless Hai Kee's place, and hope you may prove as worthy as your estimable uncle."

"To me it is a great pleasure to work for one so charitable," said Soo Yong soberly.

"There is work for you to do. Lung Hi will provide you with your uniform and initiate you in your labors" said Tsin Chan, growing stern and warrior-like again.

Lung Hi motioned that it was a sign of dismissal. Soo bowed low again and followed him from the room. Leaving a short passageway connecting with the longer hallway at the foot of the stairs, they entered what Lung explained was the basement hall. It was a huge stone-floored room running almost the width of the substructure. For the time being, Soo was to stay in the assistant houseman's room in one corner of the hall instead of the quarters occupied by the men servants.

From the storeroom, Lung Hi procured a spotless gray silk uniform consisting of loose trousers and a baggy blouse for the new houseboy. "Your first task will be to dust and polish in the south wing this morning," he said. "Your predecessor used the cleaner there yesterday."

He introduced his nephew to various of the servants working in the basement. Prosaic enough people they seemed. Soo wondered who among them might be specials or even members of the Dragon Brotherhood. Lung Hi, he knew, would be able to tell him much in due time. For the present, he must needs wield a rag and a whisk broom.

He followed the assistant houseman up into the main part of the house. Hallways radiated out from a spacious central hall. Thick rugs and gorgeous draperies gave an atmosphere of regal luxury to the great high ceilinged room. Disguised as a window, an audiovision at the north end of it was in the process of showing a snow storm in a mountain valley; the voices of the people, singing as they chopped down a giant evergreen somewhere in the high Himalayas, tuned down to a murmuring whisper.

Their footsteps muffled in the deep ruff of the rug, the two servants passed on through the center hall to climb a broad winding stairway. A house guard stood at attention at the top of it. Lung Hi gave the pass sign and led Soo down a long hallway to the center room of the south wing of the house. This, like the center hall, was equipped with an audiovision, but where the walls of the hall were covered with draperies, these were filled in by tier upon tier of bookcases. It was a more comfortable room, a much more livable place, with the warm sunshine pouring through the wide quartz glass windows.

Lung Hi demonstrated the use of the dust cloth with great seriousness. "If I should find you have missed a spot, even as large as a piegon's egg, it will not go well with you," he said darkly as he left to attend to his duties in other parts of the far flung establishment.

A girl in the uniform of a maid was not long in discovering the new houseboy, as he bent over shining the crevices of an intricately carved couch of the Ming period. During her trips across the room she favored him with long and interested glances. Soo gave her no encouragement. His work was already cut out for him. Besides, he realized that she was quite likely a special with orders to gain his confidence.

She was, he supposed, in the service of Dr. Chang Lin's daughter. The daughter doubtlessly must be a mature young lady by this time. She had been, as Soo Yong remembered her, a rather pretty child for all her stringiness. Her blue eyes and golden hair had been unmistakably Caucasian as were her mother's, while her features were molded with a trace of the Asiatic, high cheek bones and full lips.

With this picture in mind, Soo was quite at a loss to account for the presence of the girl who presently came from one of the rooms to his right, to trip lightly over to the south windows and nestle in a deep chair from which vantage point she studied the snow scene still pictured in the audiovision.

Surely this could not be little Nadja? Perhaps a friend of hers. With a furtive glance, he saw that the hair, which peeked beneath her close fitting turban-like headdress, was golden, that the eyes set in a piquant face were blue as the summer sky. There could hardly be two such girls in Chang Lin's home, with such blue eyes above the delicately tinted cheeks of the orient. It must be Dr. Chang Lin's daughter!

SOO YONG was reminded of the court in the rear of the house, unconsciously contrasted her loose-fitting cloak with the medley of color in the flower banks. Then as he lifted his head to glance at her again, she turned suddenly, her blue eyes looking straight into his somber brown ones.

"Why do you stare at me so?" she asked in a lilting voice of reprimand.

Soo rose to his feet and bowed low. "I beg a thousand pardons if I have been rude," he apologized.

She eyed him questioningly, with a faint air of condescension. The very fact that she had spoken to him was in its way a breach of the unwritten laws of the hierarchy; he was supposed to be a man of the lowest rank, while she belonged to the class of counselors. Soo Yong suspected that the maid had indulged in a bit of ladylike gossip regarding the new houseboy.

He ventured to lift his head. Again their eyes met in a slow scrutiny, held each other a moment, as in an indefinable process of awakening. Soo Yong experi-

enced a queer tightening in his throat, a speeding pulse. The soft color of her cheeks deepened, her penciled brows knitted in an annoyed frown.

"Soo Yong?" she said musically, ponderingly. Her full lips puckered in the ghost of a smile. "I wonder who you were before you became our houseboy."

Soo was struck by the fact that she had learned his name so soon. News traveled fast in the household, it seemed. He fought down a fleeting temptation to step closer to her and say: "I still happen to be second ranking assistant to Dr. Breckenridge, commander-in-chief of the Caucasian Allies." Instead, he mumbled humbly, "I was a refugee from Shanghai, your grace."

Some of his feeling must have betrayed itself in a momentary flash of his dark eyes. Her even teeth showed in a gleaming smile. "I think you are a very poor liar, Soo Yong."

The spy wondered what she would think if she could know the true story of his journey to New Hankow. He bent industriously to his cleaning. "I am sorry that your grace should distrust me," he said.

She gave a low tinkling laugh and reached for a book that lay on the window sill. It was evident to Soo that she suspected him of being a special. If so, good and well. At any rate, she had as much as dismissed him. After all, special or servant, there was an unsurmountable gulf between them. By all precedent, he should have been little more to her than a necessary furnishing of the room. Yet strangely, he seemed more than once to feel her blue eyes studying him curiously, as he bent in diligent pursuit of his labors.

Finishing the room, he returned to the basement, where Lung Hi put him to work cleaning draperies. As the assistant houseman's nephew, he found that he was treated with much greater friendliness by the other servants than would normally have been his lot as a houseboy. There were nearly a score of servants in the staff, the expense of which was borne by the University. As Lord Ruler, Dr. Chang Lin acted as host to visiting dignitaries and potentates. The north wing of the house contained more than twenty guest rooms, and the staff had consequently to be large in proportion.

At the present time, Soo learned, there were several Indian rajahs making the house their headquarters, while they conferred with the Supreme Council of the Far East Entente. The servants, for the most part, were taking their duties lightly with so small a group of guests to attend. They loitered in the basement hall, gossiping and inquiring of Soo Yong the conditions of the country along his route as a refugee.

If any of them were specials delegated to watch him, Soo had no way of knowing it. Not until well along in the afternoon did anything occur that led him to believe any of them might be more than they appeared to be.

Three men in the garb of kitchen helpers had come over to talk with him as he worked on the tapestries. One of them was a jovial full cheeked youth who giggled constantly for no good reason. The other two, in contrast with him, were glum, even taciturn. The taller of these, a lean, hawk-nosed man, humped his gaunt frame on the edge of a stool to fix the houseboy with hooded, melancholy eyes.

"You saw much hunger and want along the way, I imagine?" asked the third member of the group. His lips smiled but his eyes bore a gimlet hardness. "They tell me you were a refugee?"

The spy nodded. "The long march to Woowang was the worst," he said. "The smaller towns could supply us with only half a chin each. Me, being strong and fat then did not mind it so much. But for the mothers and children it was hard. They suffered greatly."

"Perhaps you fed from the gardens along the way," suggested the gimlet eyed man slyly.

Soo Yong gazed steadily up at him, blinked sleepily. "Do I look as though I had lost my honorable head?" he asked.

The full cheeked youth giggled loudly. "You do not look so bony to me!" he said chidingly. The hawk-nosed man allowed himself a knowing smile.

Soo Yong shrugged. The skinny man changed the subject abruptly. "I hear that forty members of the Dragon Brotherhood are to be beheaded in the Center tomorrow at sun-down," he said noncommittally.

"I had not heard it," said Soo, suddenly on guard. He had a feeling of tension, as if the three hung upon his reply.

"With the sun-down," said the hawk-nosed man with sudden emphasis. "Tell me, traveler, do you think it right that they should die because they talked too loud?"

Before Soo could formulate an evasive answer, the martial figure of old Tsin Chan appeared in a passageway. "What is this lazing to make idle talk?" he rumbled challengingly.

The three kitchen helpers rose hastily and with insincere excuses retreated to the storeroom.

Soo Yong would have told Lung Hi of the incident that evening, but he was only too well aware that the open slots in the light bracket at the top of the room concealed a visicell that recorded all movement as well as sound. Since the attempt to assassinate Dr. Chang Lin while returning from his laboratory two days previously, Lung Hi had told him a special was constantly on duty in a small closet adjoining the head houseman's office where there was a master board of all the servants' quarter.

Soo Yong had gone to bed, and tired from his long day's work as well as from the suspense of the past few days, was on the point of dozing off, when Lung Hi stole silently across the darkened room and laid his fingers on his lips. The little spy pulled his arm toward the door in a soundless order to follow him. Soo, barefooted and clad only in his night clothes, tip-toed after him. Lung led the way to a shadowy corner of the basement hall.

"We can talk here," he whispered, placing his lips close to Soo Yong's ear. "There are several things which I must warn you against. You recall the three men to whom you were talking when Tsin Chan entered the basement this afternoon?"

"I wanted to ask you about them. Those two older ones struck me as being a trifle inquisitive—too inquisitive."

"If my guess is right they were feeling you out," whispered Lung Hi. "I'll have them shadowed when they leave the university. I think they belong to the Dragon Brotherhood. May, in fact, be the men who attempted to assassinate Dr. Chang Lin. He of the hawk nose, a Manchurian of the blood incidentally, was a student several years at Moscow.

"Also, my nephew, I have been hearing stories. They say that Chang's daughter has been making guarded inquiries about you. Whether she—" Lung Hi broke off abruptly to clutch Soo by the arm. "Quiet!" he breathed.

He pointed a bony finger toward the slowly opening

storeroom door at the farther end of the basement hall. A gaunt shadow stole silently out to peer warily about the seemingly empty room. Soo Yong crouched low against Lung Hi's wizened body. By the dim milkish radiance of the single small globe light at that end of the hall, he had recognized the hawk nose of the Manchurian kitchen helper.

"Huang Yu—what the devil's he up to?" hissed Lung Hi.

HUGGING the shadowed wall of the hall, the kitchen helper moved stealthily over to the door opening on the stairway that led up into the main part of the house—a door which it was one of Lung Hi's duties to lock each night after all the servants, excepting Dr. Chang Lin's man and Nadja's maid, had retired to their rooms in the various extensions of the basement.

Huang Yu bent down fumbling at the lock. Soo could hear the rattle of a key. The door pushed gently back as the Manchurian leaned against it. For a moment, the prowler stood with his tall bony frame outlined against the subdued light that shone down the stairway; then with a quick glance back at the basement hall, closed the door soundlessly behind him.

"Be careful he doesn't see you," breathed Lung Hi. He pressed the hilt of a short bladed dagger into Soo's outstretched hand. "Use this if he corners you!"

"You mean for me to follow him?" Soo turned to whisper. But Lung Hi was already darting back toward his room, a scudding, indistinct figure that melted into the blackness of the corner. Soo stared after him frowning, undecided. Lung doubtlessly knew what he was doing, knew many things about this sinister household, that Soo had not yet had time to learn. The spy's sinewy body dropped into a furtive crouch, his lips pressed together in a thin straight line as he stole over to the stairway door.

It yielded to his touch. The stairway was empty. Soo slipped through the door to climb the steps like a stalking cat. His bare feet made no sound. He opened his mouth to breathe more softly. Slowly raising his head as he came to the top of the stairs, he peered down the wide hallway in time to see a tall shadow in the turn of the passageway. The shadow grew smaller. Soo darted down the hallway after it.

He peered around the turn. The corridor was empty. The possibility came to him that Huang Yu might be waiting in the closet-like room at the end of it, might be looking back, waiting for him. Soo teetered on his toes in indecision. Should he wait a few minutes or venture boldly ahead? What had become of Lung Hi? Would be follow? For that matter, what could be the Manchurian's objective? Soo Yong shrugged fatalistically. There was nothing for him to do but follow the man.

He crept on down the corridor to come presently to a small room. This, too, was empty. Leading from it were two doors. One, he knew, led to the guest suites in the north wing of the house. The other opened into the center hall. Soo moved unhesitatingly toward the latter. The Manchurian, he reflected, would hardly be risking a nocturnal visit to the guest rooms.

A glance into the center hall showed it to be ghostly empty. With its heavy draperies barely lighted by tiny blue wall-socket globes, it resembled some mystic, deserted temple. Soo was on the point of stepping out into it when he caught the hissing click of a gas gun used with a silencer. A heavy weight thudded into the muffling depths of a thick carpet from somewhere beyond the hall. From behind a curtain at the foot of the wide stairway climbing up to the south wing, the Manchurian suddenly darted out, gas gun held menacingly in his hand as he poised listening, with hooded eyes staring about the room. Then silently, he climbed the stairs.

"And I'm to follow him with only a knife," thought the spy. He grimaced wryly as he sidled along the gloomy west wall of the center hall.

No sound came from the mistily lighted corridor at the head of the stairway. Stooping so that he was partially cloaked by the shadow of the balustrade, Soo crept up the stairs. Four steps from the top, he rose up to peer through the corridor, crouching in the same movement. A man in the drab uniform of a guard leaned against the wall, his gas rifle held carelessly across his knees. He stared directly at the spy, his mouth gaping vacuously.

Then as Soo raised himself slowly up again, he saw that the guard was dead. Knew that he must have been shot by the Manchurian from the curtain at the foot of the stairs. "Not much doubt about what'll happen to me, if he sees me first," the spy mused grimly.

He crept on up to the top of the stairs and sighted down the corridor. The door to the center room where he had been cleaning and polishing earlier in the day stood ajar. The only persons beyond that door would be Chang Lin's daughter and her maid! Soo Yong wondered at the suddenly weakening flurry of apprehension which grasped him. Across his vision flashed a picture of blue eyes that laughed from a piquant little face. He leaped over the murdered guard's outstretched legs and slithered down the hallway, naked dagger held close against his chest.

At the door, he hesitated. Imagined he heard a key fumbling in a lock, and a softly intoned question. An instant later and there came a startled cry muffled in a snarled warning. Then came the thud of a blow in yielding flesh. Soo pushed through the door and dodged over behind the high carved back of a couch.

Light flooded through the open door at the opposite side of the room. He had a glimpe of the maid sprawled on the floor. Beyond her, the Manchurian's gaunt body hulked over the silken coverlets of a great, high bolstered bed, his long nose hooked like a beak above his sneering lips. There was a frantic struggling from beneath the covers. Then as Soo tensed himself to spring forward, the Manchurian suddenly whirled, grabbed up a limp golden-haired burden from the bed and with it clutched tightly under his arm turned back toward the open door.

Soo Yong pressed close against the shadowed back of the couch. Fingered the hilt of his dagger. It was plain to him now that the kitchen helper was a member of the Dragon Brotherhood and that a plot was under way to hold Dr. Chang Lin's daughter as a hostage against the beheading of the forty members of the Brotherhood with the next setting of the sun. Little mercy she would receive at the hands of those fanatics!

The spy's dark eyes narrowed to cold, ruthless slits. His smooth features set in a curiously expressionless mask. Poised on his toes, balancing himself with the fingers of his free hand, he stared up at the Manchurian. The killer was nearly at the couch, his thin face twisted in a malignant smirk, gas gun held out from his body to clear his path of any interference.

Soo Yong dropped his dagger, flung his slim body at the killer like a leaping cheetah. One hand caught the muzzle of the gas gun, the other the Manchurian's wrist. The killer gave a startled, cough cry; he whirled, dropping his burden. His lank frame towered over the spy's. As he recognized the houseboy, his teeth bared in an infuriated snarl.

"Out of my way, son-of-a-pig! Before I slit the throat beneath that pretty face!" he hissed. His free hand whipped down to his belt.

In the same breath, Soo Yong leaped forward, feet first, at the killer's shins. His mind worked with lightning clarity. His only chance was to hurl the killer to the floor before the man could get at his knife. The smooth muscles swelled and flowed along Soo's arched back as he dropped to the rug. He struck at the killer's neck with the edge of his hand—the deadly blow of the Japanese.

The steel-sinewed arms clutched him about the waist, dragged him close. They struggled up to the knees. The Manchurian's hand whipped a knife from his belt. Its razor edge slicked through the sleeve of Soo Yong's shirt. He clutched the knife-wrist, felt himself trip backwards. He had a glimpse of a shadowy figure gliding through the door from the hallway.

With all his lithe strength he bore down on the knife-wrist, sank the point of the blade into the floor, struck at the killer's shadowy head, wriggled from under his gripping hands. The killer reared up above him, dropped forward with stunning weight, pinning him against the couch. Yet the arm he clutched seemed curiously limp.

A light flashed into his face. He saw Lung Hi poised above the Manchurian, a bloody dagger held high for another blow. Realized why the man had gone limp. Then he saw two other figures outlined back of the lamp, one of them in the garb of a sentry.

"Move—and you die!" the sentry barked. He shoved the muzzle of his gas rifle menacingly into the pit of Lung Hi's stomach.

"What has happened here?" snapped the other. His coat showed him to be a captain of the guard.

THE light switched over to the slender little figure huddled beyond the couch. Nadja's blue eyes held the dilated, unseeing stare of one who had been doped. The sentry pressed on into the room and jerked the Manchurian's body off of Soo Yong. The houseboy got shakily to his feet.

"Thank you my uncle," he said, looking at Lung Hi. "You could not have arrived at a better time."

Old Tsin Chan came down the hallway, blowing like a walrus and a gaudily striped gown wrapped about his corpulent body. He glowered at the guard. "Put down that gun! Fool—can't you see that these men have saved the girl from the Dragon Brotherhood?"

At a sharp order from the captain, the guard lowered his rifle but continued to keep his finger on the trigger. The head houseman dropped on his knees beside the girl, listening for her heart beat. "Call Dr. Chang Lin. It is a case for a doctor," he barked at Lung Hi.

Lung, his round eyes blinking fearfully, darted across the room to the visiphone stand. Before he reached it there was a slight commotion from out in the corridor. A couple of guards came through the door, wheeled abruptly to stand at attention on either side of it.

The lights in the room switched on belatedly. An elderly, slightly stooped man who appeared tall only because of his extreme emaciation, strode into the center room. A long mandarin robe of gold and black hung from his shoulders. A small round cap of the same material sat back from his bulging forehead. Soo Yong looked up into the shrunken face and jewel-hard eyes of Dr. Chang Lin.

He bowed low as did the others in the room. Chang Lin hurried on past them, his sunken features mirroring a terrible anxiety, to pick up his only child and lay her on the couch. Swiftly his deft fingers examined her to conclude, as Soo already had, that she had suffered no greater harm than the administration of an anesthetic. He turned then on old Tsin Chan with a suddenness that frightened the old warrior. "Why should I find my daughter like this? Have I no guards in my house?"

Tsin Chan nodded agitatedly. "You have, my lord, but we were taken by surprise. This man," he pointed savagely at the body of the Manchurian, "came to us with the highest of recommendations. How could we suspect him of such duplicity?"

Dr. Chang Lin wheeled around to glare at Lung Hi. Then his jet eyes shifted suspiciously to Soo Yong. "Who is this man?"

"The new houseboy, your honor, nephew of the estimable Lung Hi. It was he who rescued her grace, your daughter, from this snake of a Huang Yu."

Dr. Chang regarded the spy impassively. "How did all this turmoil come about?" he asked of Lung Hi.

It was Tsin Chan, however, who answered. "In the basement a few minutes ago, Lung Hi had started to get a drink when he saw Huang Yu unlocking the stairway door. He awakened his nephew and told him to follow the Manchurian while he summoned the guard. Is that not correct, Lung Hi?"

"It is, sir," said the assistant houseman.

It came to Soo of a sudden what had been this wily operative's purpose in darting back to their room. Lung Hi, knowing a special was listening in on the master visicell, had carried on an imaginary conversation with his nephew before phoning the guard. Thus he had hidden the fact that neither of them had been in the room and at the same time had made certain that their motive in leaving the basement was not misunderstood.

"It would seem," continued Tsin Chan, "that the two of them were none too soon in arriving."

The maid who had recovered sufficiently from a blow over the head to stagger out of the bedroom, verified the story. Dr. Chang dismissed the guards and ordered Lung Hi to see to the cleaning up of the room. He turned to Soo Yong who still stood ill at ease at the end of the couch.

"You were armed, my servant, when you attacked this man?" he asked.

Soo Yong shook his head. "My honorable uncle had given me a dagger, but I was forced to discard it in order to grab the Manchurian's gun."

Dr. Chang Lin nodded to himself, permitted his cruel slit of a mouth to fashion the faintest of smiles. "You are gifted with the fool-hardiness of youth, my servant," he said in a voice quite different from the measured tones which he had used in the lecture room, when Soo had been a student under him. The Lord Ruler of the university, for all his reserve, was quite evidently in no easy state of mind. The recent attempt on his life combined with the nearly successful kidnapping of his only child had plainly shown him that safety did not reside alone in armed guards and impassable walls.

He turned back to the head houseman. "From now on, if you think it advisable, this courageous one shall be posted as a guard in my daughter's wing of the house, following her at a proper distance, when she sees fit to visit other portions of my home. His wages shall be doubled."

Tsin Chan fixed the houseboy with fierce eyes. "It seems advisable to me, my lord," he said approvingly.

Dr. Chang addressed the spy. "You will take up your duties with the morning."

"You are very gracious, my lord," said Soo Yong. He bowed low and left the room.

He told of his promotion to Lung Hi while they dressed and waited for the guard car to come and take away the body of the kitchen helper. The assistant houseman fingered his nubbin of a chin reflectively. "It is better fortune than I had hoped for, when I directed you to follow the Manchurian," he said. "In such a position most anything may happen."

Soo realized that he was referring to gaining entrance to the wall of the laboratory. "Perhaps fate guides my steps?" he said.

"Perhaps," said Lung Hi. He smiled enigmatically.

AFTER they had finished cleaning up after the removal of the would-have-been kidnapper and had returned to the basement hall, they found that almost the entire servant staff had gathered there to find out what had happened. Some of them had been awakened, it seemed, when the guards had carried the body of Huang Yu out through the servant entrance. The guards would tell them nothing and it was thought that another attempt had been made on the life of Dr. Chang Lin.

Lung Hi told them briefly of the killing of the kitchen helper. The women of the staff chattered about it in excited whispers. The men were for the most part silent. Soo looked about for the two helpers who had been the Manchurian's companions earlier in the day. The fat youth avoided his gaze, but the skinny helper with the gimlet eyes and sour pucker of a mouth met his probing glance with a look of faintly veiled mockery.

Soo experienced a vague uneasiness. The man had seemed to gloat over some triumphant secret. Lung Hi curtly ordered the servants back to their rooms. He waited until the last of them had departed, then carefully locked the door to the stairway.

"I have a suspicion that Huang Yu's companions bear us no good will," he muttered to Soo as they crossed the basement hall. "It seemed that Mo Tzu, also of the kitchen, looked upon us as men already dead."

"The same thought was mine," said Soo. He had started to open the door to their room when Lung Hi jerked his blouse.

"Let us tread gently," said Lung. "Someone has turned off the light which we left burning."

He slowly opened the door, reached through the widening crack to snap on the light. Almost in the same second there was a soft spitting sound from the floor. Lung Hi threw open the door, peeked around it, then leaped wildly back. "Don't breathe—hurry!" he gasped. He raced back out into the basement hall with Soo at his heels.

Soo still held his breath when they stopped by a door to the outside passageway. Lung Hi flung it open. "We can take some precious air now," he wheezed. "Truly there are those who no longer love us about these parts!"

"What was it?" panted Soo.

"A gas box—if I am not mistaken. We'll leave the door open long enough for the fumes to be carried into the ventilators before we go to see if I am right or wrong. It will be safe in fifteen or twenty minutes."

They sat down on a bench to wait. The night air sucked through the basement with damp, chilling coolness. Soo Yong shivered in his thin silken clothing. Lung Hi suddenly lifted his head, listened intently, then darted over to the passageway leading to the quarters of the men servants. Soo heard a door being hastily shut. Lung came back and sat down on the bench.

"I ran too swiftly," he grumbled. "The door was closed before I could recognize who had opened it."

"It likely would not be hard to guess," said Soo.

They sat humped up on the bench like a couple of roosting pheasants until the hall clock had ticked off ten more minutes. Lung Hi came to his feet and closing the passageway door led the way back to their room. He entered it cautiously, stopping with every step to draw a short, quick breath. Soo followed his example. Back of the door, and set in such a way that it would be struck when the door was opened, was a tiny box. Two vials had been arranged in it in such a manner that they would empty into a shallow saucer, which, like the vials, was now empty.

"A nice deadly little cacodyl cyanide* generator," Soo was on the point of saying before he remembered that a coolie refugee would hardly be so familiar with the manufacture of deadly gases. "You think there was poison air in this, my uncle?" he asked.

"There can be little doubt of it," said Lung Hi. "In the morning I will report the matter to the captain of the guard. Also, we must be up early. Before you assume your new duties, Tsin Chan will probably suggest that I introduce you to other parts of the house and grounds." The lid of the assistant houseman's right eye drooped wisely.

THE mellow booming of a bronze gong awoke Soo Yong, it seemed to him, almost before he had gone to sleep. Sunlight flooded in the narrow slits that passed for windows at the top of the room. Soo yawned drowsily and stretched prodigiously. His shoulders and back were stiff from his fight with the Manchurian the night before. Lung Hi, grumbling, hopped out of bed and into his clothes. Soo did the same and trailed after him to the dining hall.

After they had eaten, Lung reported to the head houseman, then returned to show Soo about the house. They went first to the north wing. "This is really a small hotel, walled off from the rest of the house except for a single door which is usually locked," Lung Hi explained. "Custom has it that the Lord Ruler of the university must entertain the more important visitors. Since the war, however, Dr. Chang Lin rarely sees his guests during their stay here."

Soo could not but be impressed by the luxurious comfort of the suites. Large windows of quartz glass with their veil-like screens faced the sun, bringing in only suffused and healthful light. The ventilators to the rooms, Lung pointed out, used purified air treated with the faintest of perfumes. Whereas Dr. Chang's portion of the house was furnished in a purely oriental manner, these rooms had been fitted with every modern convenience from reading machines to flesh reducers.

*Cacodyl As $(CH_3)_2$ in this compound plays the part of a monovalent radical and forms a haloid salt As $(CH_3)_2$ CN. It is a deadly poison owing to the arsenic (As) and cyanogen (CN).

Leaving the north wing, Lung Hi guided Soo through the flower bordered walks of the court at the back of the house. It was as though they had been suddenly transported to another world, the China of two thousand years ago. Soo would have lingered, but No. 548 rushed him on through the gardens to the rooms at the back of the court.

"Note carefully what I will show you, my nephew," he cautioned. "You may some day have use of the knowledge."

The guard on duty before a heavy door at the end of a short hallway, seemed reluctant to let Lung Hi past. The assistant houseman harangued him loudly, then pushed on into a long room with great barnlike doors that opened out into the university grounds. Two mechanics were working busily at a long bench. Back of them, placed in such a manner that they would automatically roll on to starting pedestals outside the building with the opening of the doors, were two giant aerocopter racers. Their smooth beryllium bodies were painted in the black and gold insignia of the Counselors, the ruling class of the Chinese hierarchy.

"These are Dr. Chang Lin's private racers, used only in times of emergency," said Lung Hi. "No other aircraft are allowed above the university."

"It must be a great pleasure to ride in one of them," Soo moved around to eye the nearer of the racers admiringly.

Lung Hi shook his head. "Such craft are not for the lowly born such as we."

One of the mechanics left his bench. "You would probably wreck it in your first flight," he said with the air of one who boasts superior knowledge.

"You are right. I had not thought of that," Soo Yong humbly agreed. He smothered a faint smile at the thought of the thousands of miles he had flown a machine very much like one of these.

Lung Hi conducted him presently back to the south wing of the house and gave him a duster. "You will continue to act as a houseboy in observance of your other duties," he said.

Soo set about lazily dusting the already dustless tiers of books in the center room where he had battled with the Manchurian a few short hours before. The hours dragged. He polished the scanty draperies of a small seated bodhisattva,* and cleaned behind a series of landscapes of the Sung period, weird paintings that depicted dragons and waterfalls among cavernous rocks, and islands that floated in misty ill-defined seas. He studied the titles of the books. Among those of a more serious nature were many of the texts of Dr. Breckenridge. Soo was tempted to take down one of them and read it, then thought better of the idea. The warm sunlight flooding into the room made him listless.

Several times during the morning, Nadja's maid made hurried trips across the room. It was not until nearly noon, however, that Nadja herself put in an appearance. The spy bowed low as she came out of her bedroom to curl up like a kitten in one of the deep chairs by the window. Noticed, with a strange tightening of his throat, that the cheeks above the soft green sheen of her gown were pale, that the blue depths of her eyes regarded him wistfully.

For a long while she said nothing. Soo Yong, as he looked at her, thought he had never seen anyone so beautiful. The lids of his dark eyes lowered as those of one in infinite pain as he thought of the invisible barriers between them.

A slow wan smile parted her full lips. "For one who came so gallantly to my rescue, you do not seem happy at finding me conscious again?" she questioned, her voice a musing murmur.

Soo Yong avoided her eyes. The very fact that she should be looking at him, speaking to him, not as a servant, but as a man, created an impossible situation. Yet this was nothing to the fact, that should occasion arise in which her presence endangered his obtaining the cultures of the Purple Plague and dispatching them to his superior, duty bound him to kill her as ruthlessly as he had the special at Tungchang.

This same duty, he told himself, demanded that he take every advantage of her confidence. The man within him revolted at such deception. He realized fearfully that he wanted her as he had never wanted anything before in his lonely, studious life. His eyes lingered on the gentle curves of her body, revealed through the soft drapery of her gown, traveled slowly up to the clean cut curve of her throat to rest on her full red lips. The blood pounded through his temples. He drew a tremulous breath.

"I hope Your Grace has fully recovered from her unfortunate experiences last night," he said.

Her brows knitted in a slight frown of annoyance. "You have not answered my question, Soo Yong."

"I am happy to see Your Grace, again."

"Only happy?"

The spy could have groaned. "Your Grace does not understand," he protested. "A houseboy can be no more."

"But are you just a houseboy, Soo Yong?" she pressed him. "You did not know that I had been watching you through my visiphone while you dusted the honorable books. Surely a houseboy would not be interested in such weighty volumes? Why it seemed to me that you were tempted to study texts which only my father would understand."

Soo Yong's smooth features settled into a blank impassive mask. How much could she suspect? He must have been temporarily off guard there by the book case. "I wondered only what hidden secrets they might hold," he said. Curiously, he felt that she knew he lied. He added hastily, "It is only with great labor that I am able to read, your grace. Which no doubt accounted for your reaching such a conclusion."

The blue eyes grew hurt, then in the same breath scornful. "No doubt," she agreed with a disinterested shrug. She ignored him to gaze steadily up at the audovision screen. Yet her cheeks, Soo noticed, were flushed and her little mouth set tautly.

He cursed himself for a blundering fool. To have crudely insisted on the distinction of their classes after she had admitted an interest in him to the point of watching him through her visiphone, was reprimand enough to one of her caste. Still, there was no other course he dared have pursue. Or was there? He bent to his dusting with furious energy.

With the ringing of the noon gong he descended to the basement to eat in the long dining hall with the other servants. The two kitchen helper friends of the Manchurian were missing from the table. When Soo had finished eating, Lung Hi motioned to him. He fol-

*In the Buddhist belief in reincarnation one who has reached the highest degree of saintship, so that in his next incarnation he will be a Buddha, a deified religious teacher of the Buddhists.

lowed the assistant houseman to a corner of the basement where the latter sat down on a bench to light an evil smelling little pipe.

"It appears, my uncle, that we have two vacant chairs this noon." Soo remarked guardedly.

"The matter was one of which I wished to speak," said Lung Hi. "I had told Tsin Chan of the gas box and of their friendship with Huang Yu. The captain of the guard was to question them and search their room."

"They were arrested?"

"In their room were found papers indicating that they belonged to the Dragon Brotherhood," continued Lung, ignoring the interruption. He puffed on his pipe. "But when the captain of the guard went to the kitchen to arrest them, both had disappeared. The outside sentries claim they have not left the house. If that is the case they must be somewhere in hiding. But where—neither the guard nor myself have been able to discover."

"You think it would be well for me to hurry back to her Grace's rooms?" questioned Soo. He was perturbed that he should experience such keen anxiety.

"It would be well," agreed Lung Hi.

SOO lost no time in grabbing up his duster and returning to the south wing of the house. He drew an easier breath as looking through an open door of the center room, he saw Nadja eating her lunch at a small crystal table. Glancing up, she looked out at him, then quickly averted her head. The houseboy, with the ghost of a smile quivering the corners of his mouth, moved over to putter around a niche containing antique bronzes.

The girl did not look at him as she crossed the center room to return to her bedroom. Not until a hour or more later did she reappear. Her feet were encased in small metallically glossed boots. On her head she wore a helmet-like hat of the same material. Her cloak was of coarse silk, silkworm silk instead of the artificial product used in Soo's uniform. Without so much as a glance in his direction, she opened the door into the corridor. Soo laid down his dust cloth to follow her. From the corner of her eyes she caught his movement, then turned her little chin militantly to the front to march down the hallway.

Passing on through the center hall, she continued on out to the court at the rear of the house. Soo Yong, trailing her at a respectful distance, paused in admiration of a clump of fragrant narcissus. Nadja turned suddenly to march back and stand a pace from him, staring indignantly up into his somber eyes.

"What is the meaning of this? To follow me like a shadow! Have you not the fitting manners of a servant? Or must I call Tsin Chan to tell you what is right and wrong?"

"My orders were the making of your honorable father," he said humbly.

"Oh, so that is it? You are another of these specials who must constantly dog my footsteps!"

"I am only your servant, your Grace."

"My servant. Very well then, I ask you to leave the court at once."

"But, your Grace——"

"At once!"

"Your father's orders, your Grace, were——"

"Oh, no doubt," she cut in, her tremulously blue eyes lowering before his steady gaze. "At least, I order you to keep your distance as a servant."

She very nearly stamped her foot as she turned to move off energetically through the pampered shrubbery. Soo Yong was scowling as he stared after her. She stood on the bridge of the moon, looking down at her reflection in the mirrored face of the pond, a troubled little figure in gold and blue. She slipped off her headdress and the sunlight played like living fire in her bobbed tresses.

Soo Yong sank wearily down on a bench half hidden beneath the blossom-laden branches of a Japanese plum. He held his head in his cupped hands. A week ago, he asked himself bitterly, who could have imagined he would be taking orders from an impetuous chit of a girl. And, for that matter, where was it getting him? Would he ever be able to get inside of Dr. Chang Lin's laboratories? Yet he must somehow get cultures of the Purple Plague! Either that or lose his life in the attempt. Every fleeting hour was more precious than radium. Yet here he sat, doing nothing. He shook his head miserably.

Peering out through the shell-pink screen of the blossoms, he saw that Nadja had continued on across the bridge, to wander aimlessly along the criss-crossed paths at the farther end of the court. Soo caught a gleam of light reflected from the muzzle of a gas gun. The guard outside the aerocopter shop, he decided, must have stolen down the hallway for a glimpse of the flower banks.

Soo settled down on the bench again. Then suddenly sprang erect as he heard a choked, frightened cry. Nadja shrank back against the slender stems of a clump of bamboo. The guard threw down his rifle, leaped toward her, grasped her by the throat. Soo had a flashing glimpse of the man's face. He recognized the close set features and gimlet eyes of Mo Tzu, one of the missing kitchen helpers.

"Another of the Dragons! And I had ceased to watch," thought Soo. "Lung Hi warned me. Fool that I am!"

He sprinted down the winding path that paralleled the edge of the pond. Nadja struggled desperately, her little boots beating a tattoo on the helper's bony shins. The man spit out a hissing curse, twisted her head cruelly. His long teeth bared in a snarl as he saw Soo Yong racing toward him. Bending down to pick up his gas rifle, he rested it on his hip, pulled the trigger.

A stream of bullets clipped the leaves about the spy's rushing body. Soo felt a stunning impact against his shoulder. It threw him sideways. He stumbled over the border of a flower bed, plowed headlong down into a tangle of roses.

He rolled to his feet, teeth set against the piercing pain of a thousand tearing thorns. The helper was dragging the girl back into the hallway, had disappeared in it. Soo hurled himself savagely down the path. The naked body of the murdered guard, whose uniform the dragon was wearing, lay against the side of the hallway. The door of the aerocopter shop slammed shut. Soo threw his shoulder against it, felt it give. He braced himself, straining to force it open. The man on the other side of it fought to slip home the bar. Some one hissed out an order. Soo thrust his toe through the widening crack. Splinters fell from the panel above his crouched body as the magazine of a gas gun was emptied into it.

He heard the sound of the outside doors sliding back. A thud as of a falling body. Then the gentle whirl of starting propellers. With a heaving lunge, Soo forced the door open. The muzzle of a gas gun was thrust at

his chest. He struck it down; he drove his clenched fist into the gasping pasty face of the younger kitchen helper and brought his knee up into the man's groin. The helper sank to the floor, writhing in pain, eyes bulging, lips mouthing a futile curse. He tried to raise the gas gun.

Soo kicked it out of his hand. He stared wildly about the room. The aerocopters stood outside the building on their starting pedestals, the propellers blurring on the nearer of them. The door to the cab hung open. Soo Yong had a glimpse of Nadja. Her blue eyes stared in terror at the angular uniformed body of the Dragon bent over the machine's controls. The spy sprang toward the aerocopter. He saw the limp bodies of the mechanics lying on the floor of the room. Mo Tzu looked down at him as he raced toward the machine's open door, sneered as he pushed over the rising lever.

THE hum of the propeller blades rose to a whining roar. The blast of air from them hurled Soo Yong back. He bent double, flung himself into it. The aerocopter was slowly rising. Guards were running from the front of the house. The door above him slammed shut. Soo clutched at the mounting ladder, was nearly swept away by the increasing blast of air from the blades high above him.

The aerocopter shot up faster and faster. The blast grew stronger. Soo grabbed at the knob of the baggage compartment door, found that it was unlocked. Somehow he managed to squeeze his body into the narrow space back of it. The rush of air slammed it shut. He peered out the tiny oval of a window. Beneath him the guards gesticulated wildly. One of them was running back toward the front of the house.

Soo wondered if the man in the cab above could know he had managed to stow away in the baggage hold. Not likely, though, since the latter had probably been busied with his controls after closing the door. Even if he did know he was there, there was nothing Soo could do about it. The spy examined his shoulder. The full force of the charge had missed him, had only bruised and torn the end of his collar bone.

He gazed out the window again. The earth dwindled away beneath them. The speed of the aerocopter increasing geometrically, he knew that they must already be traveling at a rate of five or six hundred miles an hour. The machine levelled off. They shot out across the flat fields surrounding the university. From above Soo could make out the network of cracks and squares which he knew to be anti-aircraft gun placements. In the black and gold aerocopter of the Counselors, rulers of the hierarchy, however, no gun would be aimed at them.

For that matter, whoever took up the pursuit would not dare shoot for fear of injuring the craft's passenger.

"Nothing can hurt me for the time being, anyhow," mused Soo.

The pilot of the stolen craft couldn't look into the compartment as long as they were in the air. Couldn't for that matter, shoot through the compartment since the fuel tanks were between it and the cab. The spy wondered how long it would be before the pursuit would start. At least several minutes, he figured.

Already they were past the last outskirts of New Hankow. The Dragon was turning the machine to fly down the valley, close to the wall of mountains reared up on their right. They flashed across the quadruple tracks of the K. K. monorial. Then Soo noticed that the crazy quilt pattern of the fields was rising up to meet them. Was the pilot going to land or merely fly close to the ground in an attempt to throw off the audio finders? Soo's brow wrinkled. What would he do if they did land? He hadn't thought of that as yet. Hadn't had time.

Ahead of them there swept up the green tops of a forest which he recognized as the Sun Yat-Sen national park. They came down to within a few hundred feet of the tree tops, swept in a soaring circle. Soo Yong saw the black torpedo shaped body of a tube car darting down the highway that ran through the park. A green light winked off and on from the top of it.

The racer swooped on ahead to hover above a small glade. Half a mile to the east, Soo could see the incessant stream of cars that ran day and night on the hundred foot slab of the Singan to New Hankow highway. The aerocopter sank slowly toward the ground, propellers idling and acting as autogiros.

The ruse that the conspirators were planning to use dawned all at once upon the spy. Nadja would be transferred to the tube car and rushed back to a hiding place in the city while Mo Tzu stayed in the racer to lead the pursuit in a wild and futile chase, waiting for nightfall to make his own escape.

"My only chance," thought Soo harassedly, "is to gain control of the racer before we reach the ground."

Once they had landed, he knew how short would be his shift with the desperate members of the brotherhood, who would be waiting in the tube car. He looked about for a weapon, a sudden reckless scheme formulating in his mind. There was a tool box beneath his knees. He lifted the top of it to grab up a short wrench. With this in his belt, he cautiously pushed open the compartment door. A glance showed him the grassy face of the glade a few hundred feet beneath him. The pilot circled slightly, probably in search of a landing spot.

Since the propellers acted as autogiros, there was no wind sweeping past the racer other than that pulled into the blades as they dragged against the air. Soo Yong swung out of the door to the smooth streamlined rungs of the cab ladder. He climbed up them warily, peered through the window in the cab door. Mo Tzu was hunched over his controls, was staring intently down through the floor window.

Nadja was huddled in one of the seats, shoulders slumping despondently as she gazed down at her bound wrists. Then as she raised her head, the spy saw that she had been gagged. Her blue eyes opened wide as she saw his head framed in the window. Reading his purpose, she shook her head frenziedly.

Soo raised a finger to his lips in a gesture of warning. A glance down to the glade showed him that the tube car had pulled up and stopped at one side of it. Three men had tumbled out of it, were staring up at him. One of them raised a gas rifle to his shoulder. Soo jerked open the cab door and flung himself at the man bent over the controls. He brought the wrench down in a crushing blow at the back of Mo Tzu's egg shaped head.

The Dragon must have seen his reflection in the dashboard or had heard the opening of the door. He dodged the wrench, reared up from his controls, pinpointed eyes firing with sudden demoniac light. His hand darted down to the gas gun in his belt.

"Son-of-a-fool, do you want to wreck us?" he hissed.

Soo Yong lashed out at his gun wrist, knocked the gun

from his hand. The helper drew a knife. Soo parried his thrust with the edge of the wrench, endeavored to strike it also from the helper's hand. As he lifted the wrench for the blow, the knife flicked out like a striking snake, raked across his chest, bit through to his ribs. Soo leaped back. Smirking, the helper followed him.

The aerocopter, with no one at the controls, drifted gently on down to the earth. Soo feinted with the wrench, caught the kidnaper's wrist, and dropped the wrench to hurl the man forward in the same devastating arm drag which he had used on the Manchurian. Mo Tzu must have anticipated the move. He sprang forward even as Soo pulled down on his arm. They fell to the floor of the cab in a thrashing tangle.

From the corner of his eye, Soo saw the girl spring to her feet and lean toward them. He cried out for her to keep back. Then he saw that she had grasped the rising lever. The engine of the aerocopter came to life with a hissing buzz. The giant blades bit into the air. The machine shot up dizzily into the sky like a suddenly released rocket.

The helper had freed his knife wrist. His teeth bared in a snarling grimace of triumph. The blade caught the sunlight as he raised it above his head. Nadja clutched at it with her bound hands, but failed to catch it. Soo grabbed the descending wrist, wriggled from under the point of the blade. He thrust his knee up into the Dragon's stomach and, rolling backward, flung the man hard against one of the seats. Before Mo Tzu could regain his knees, Soo was on him in a burst of fury. He snatched up the wrench and brought it down with stunning force on the side of the Dragon's head. The kidnaper lunged forward, arms outflung in front of his head.

Soo reached back to switch off the engine. For a moment the aerocopter continued to shoot upward under it own momentum. Then as it started slowly to descend again, Soo Yong jerked open the cab door and rolled the Dragon's inert body over the sill to see it go hurtling down to the greensward of the glade far below.

Nadja's eyes opened wide in horror.

"It was best," panted the spy fiercely. "We could only have saved him for the beheader."

He picked up the fallen dagger to cut the bonds from her wrists, then turned to take over the controls of the machine while she fumbled with the knot of the gag. Under his steady fingers the racer shot slowly up into the air again. He leveled it off to turn back toward the university. His lean face was set in grim uncompromising lines.

NADJA, when she had finally cleared her mouth of the gag, leaned back weakly in the seat. Soo Yong, studying her in the dashboard mirror, saw that the glistening globule of a tear trembled from her long lashes. She glanced up at him with something akin to fear, then seeing that he watched her in the mirror, quickly averted her gaze.

The spy, thereafter, confined his attention to the route ahead. Sighting through the telescopic guide, he could see New Hankow some ten or fifteen miles to the north. Judging from the traffic that traveled up the center of the valley, the incoming air lane was at a slightly higher level. Soo climbed up to it, noticing that the other machines drew hastily out of the way of the black and gold racer.

Nadja touched him on the shoulder. "You are bleeding. Are you badly hurt?" she asked with a fine air of disinterest.

Soo looked down to see that the front of his blouse held a spreading crimson stain. He felt of the knife wound on his chest, shrugged. "Would you care greatly?" he countered coldly.

She bit her lip and settled back in the seat. "I would hate to see even a dog bleed to death," she said shortly.

Soo Yong set his jaw and stared out at the rapidly growing towers of the city. Flying so swiftly that their metallic bodies shot through the air like a line of bullets, a fleet of Midget destroyers suddenly swarmed about him. One of them, painted with the golden stripes of the fleet commander, pressed in close to the racer. Its driver waved over to attract Soo Yong's attention, then made an imperative gesture for him to bring the aerocopter down to the ground.

The spy stared back at him and shook his head. He raised up so that the fleet commander could see the bloody front of his shirt and waved his hand in pantomime to show that he had been wounded in a fight with the kidnaper. The audiphone was at his elbow, but he disdained to use it, preferring the commander to think him ignorant of its use. He motioned to show that he had thrown the helper from the machine and pointed back toward the forest.

The fleet commander seemed unable to catch his meaning. He held up the headgear of the audiphone and motioned for Soo Yong to do the same. Soo grimaced distressfully and went through the pantomime again. The flight commander seemed to partially catch his meaning. A portion of the fleet broke away to continue back along the course from which the aerocopter had come. Soo Yong motioned to show that he would take the racer back to the University.

Frowning, the flight commander and the remainder of his fleet hovered in their positions about the aerocopter. Soo smiled grimly to himself, knowing that there was nothing else they dared to do, much though they may have wanted to stop him with a well directed bullet.

He glanced back at Nadja as he increased the speed of the racer. She eyed him coolly, a tiny puzzled frown creasing her brow. Soo Yong sighted down through the telescopic guide. He hardly needed it now. Already, they were above the level fields outside the walls of the University. In another breath they were over the laboratories. The spy switched off the engine to let the racer float down on its propellers.

His dark eyes were narrowed to mask any thought of the strategy which he had been shaping in his mind. He could do it. He would do it! By feinting awkward unfamiliarity with the racer's controls, he would tilt the guiding fin in such a manner that instead of landing beside Dr. Chang Lin's house, the racer would drop down inside the doubly guarded walls of the laboratory!

The machine was down to a thousand feet. Looking through the floor window, the spy could see the grounds of the laboratory slightly to the left of him. Its buildings were etched in detailed miniature. The laboratory proper, he saw, was walled off from the greater part of the enclosure. In this larger portion were tile-roofed stables and hundreds of horses in the lots outside them. Beyond the stables was a large building which he knew, from plans studied in the New Hankow espionage headquarters, housed the attendants to the animals used in producing antitoxin serums, attendants who were never allowed outside the laboratory walls.

The smaller buildings of the laboratory proper stood by themselves in a smaller walled off square at the corner of the enclosure nearest Dr. Chang Lin's home. There was an octagonal grassed court at the back of the buildings. The spy tilted the guiding fin to angle toward it.

The fleet commander endeavored vainly to attract his attention, to motion him away from the laboratory. Soo Yong stared agitatedly down through the floor window. Nadja still watched him, puzzled. He raised up to eye her impersonally from over his shoulder to forestall her offering to land the racer.

White garbed figures had come out of the central door at the back of the laboratories to stare up at the aerocopter, talking excitedly to one another. A company of guards appeared on the separating wall to stand with gas rifles held conveniently on their hips. Soo fingered his controls to make the racer sway dizzily, to give his watchers the impression that he was attempting to land outside the walls. Nadja, he realized, must have guessed the deception he was practicing. Her steady scrutiny worried him, unnerved him.

Could she finally have formulated her suspicions into a shrewd guess as to his real purpose in New Hankow? Or if she had, would she betray him? Soo's peeled knuckles stood out white as he clenched the control lever. His own personal feelings had nothing to do with the matter. His duty was to obtain the bacilli of the Purple Plague.

The aerocopter was settling far too rapidly, he knew. The green octagon of the court magnified with each flashing second. The separating wall pushed up to meet them. Guards scurried for cover. Soo played his rudder with a skill that appeared accidental to slide past the wall. In the next breath, the racer landed in the court with a violence that flung him heavily to the floor of the machine.

Guards ran up. The cab door was yanked open and Soo Yong struggling to his feet, found himself looking into the black bore of a gas gun and the equally black and menacing eyes of the guard above it.

"Out of there—you!" the latter snapped.

The spy stepped shakily toward the door. Nadja untangled herself from the seat, the deep cushions of which had taken up most of the shock of the faulty landing. She gazed coldly at the guard.

"Since when do you order my servants to precede me?" she asked.

The guard bowed, stepped shamefacedly to one side. Looking beyond him, Soo Yong could see the white-suited staff of the laboratory hurrying across the court. In the lead was the thin body and emaciated features of Dr. Chang Lin. Practically all his assistants were in the group behind him. These were elderly, scholarly men for the most part. Soo recognized several of them as professors in the University.

Nadja had stepped past him to jump lightly to the ground and advance to meet her father. "My child, my child!" whispered the old man hoarsely. He threw his arms about this precious daughter to hold her close to his withered body.

Soo climbed stiffly down to the lawn, noting that the guards still watched him suspiciously. He leaned back against the ladder of the racer, feeling much as though he had unwittingly stepped into a trap. Little good it was going to do him to be inside the laboratory walls. To attempt to enter the buildings would be the purest sort of foolhardiness.

As he waited, shifting his weight uneasily from one foot to the other, Dr. Chang Lin suddenly lifted his sunken, jewel hard eye to regard him solicitously. "You are wounded, my servant? But it is plain that you are," he said. He turned to the group of assistants behind him. "Dr. Feng—will you please take this man into my office and dress his wound?"

A middle-aged man, whom Soo Yong remembered as a laboratory instructor in his student days, left the group to continue on toward the wrecked racer. "You will follow me, please?" he said with a friendly smile.

"With pleasure, sir," said the spy.

He paused to bow stiffly before Dr. Chang Lin. Nadja whispered something in her father's ear. Chang nodded in agreement but said nothing. Soo Yong could feel the interested gaze of the little group of scientists following him as he accompanied the corpulent body of Dr. Feng.

They entered the main door at the rear of the laboratory. In those careless days previous to the war, young Dr. McCarthy, the American bacteriologist, had spent many hours working here. He found the interior of the building little changed. Dr. Feng led the way down the long hallway that ran through the middle of it. Near the end of the hallway, he turned into a short passageway and opened the glass-paneled door at the end of it.

The room beyond was large, and was in fact an informal classroom as Soo remembered it. There were numerous comfortable chairs ranged in a semicircle about Dr. Chang's broad-topped table. Directing the spy to sit down, the doctor made a hasty examination of his bruised shoulder and the knife wound in his chest.

"Not bad, not bad at all," he muttered through pursed lips. "The only thing we have to watch out for is infection. Take off your shirt and I'll wash and dress them."

Soo gazed interestedly about at the charts and diagrams on the white walls as he removed his torn blouse. As the doctor's back was turned, he twisted casually around to look out through the glass panels of the door into the passageway beyond. Through a similar door at the opposite side of the latter, he could see into a small dressing chamber.

While he watched, there was a fumbling back of the rubberized material that formed the rear wall of the room. A slit suddenly appeared in it and a man stepped out. Being familiar with the plan of the building, Soo Yong knew that he was leaving the main culture room, the room where doubtlessly the bacilli of the Purple Plague were being constantly grown. The anteroom was in reality two rooms separated by the curtain. While working with the cultures, the laboratory assistants wore the customary hooded suits, which covered them completely from head to foot.

On leaving the main culture room, they entered the other side of the anteroom. Zippers in the rubberized wall fitted into the front of the suits. Consequently, the doctors and assistants could leave the plague room with no danger of carrying the cultures out with them.

Soo wondered if any more of the assistants might be in the culture room. If not, what was to keep him from rapping Dr. Feng over the head and making away with a tube of the bacilli? If he could only get them to Lung Hi before he were captured! Common sense told him that such a course would be helpless. He could never get clear of the laboratories, much less reach Lung Hi.

Yet the knowledge that his goal was so close, so unguarded, roused his mind to a restless frenzy. If there

were only some way he could slip into the plague room without the doctor suspecting. Feng had returned with a basin of water and commenced washing the deep gash in his chest.

"You have won great favor with Dr. Chang Lin for this afternoon's work," said Feng warmly. "I would not be surprised if he made you a captain of the guard. Certainly, you may expect a suitable reward."

"It was only my duty," protested Soo Yong.

"You will profit by it none the less," said Feng. He examined the gash more carefully. "I believe I'll take a few stitches here." He nodded thoughtfully. Then strode over to the heavy door of a closet at the north side of the office. Switching on a light, he searched through a set of drawers. Soo Yong could see that the shelves of the closet were covered by a great assortment of vials and surgical equipment. He saw, too, that the door was equipped with an outside lock.

It was this last brought a twisted mirthless smile to his lips. The lock was on the outside! His dark eyes glowed like wind blown coals. Fate would never present a better opportunity. Fortune had been far too kind already. The spy came silently to his feet. Feng's back was toward him. Soo darted across the office on tip-toe. He stood back of the closet door, swung it softly shut as though it had slipped off its holdback. His arm reached out to slip the catch.

In the same second, he whirled and grabbed up one of the small empty bottles on a tray beside Dr. Chang Lin's desk. He leaped noiselessly toward the office door, peered out into the passageway, saw that it was empty. In a flash he was across it and into the anteroom. He had no time to slip into one of the hooded suits. There was a narrow door at one side of the curtain that said on it: "For Emergency Only."

The spy flung it open, rushed across the rear anteroom. Quickly opening the heavy door to the plague room, he peeked into its half lit shadows. He saw that it was empty. It was not a particularly large room. The machines, used to keep it at a constant temperature and light, he knew were in the basement below. There was a long stone bench at the south side of it. On this, ranged in giant quartz test tubes was a double row of what Soo Yong knew were cultures of the Purple Plague.

NO other reason could account for their being grown in such huge quantities. The air in the room was hot, humid. Soo held his breath as he dashed over to the bench. The nearest tubes contained clear, translucent blood agar. As a bacteriologist, Soo knew them to be new cultures. The tubes at the other end of the bench were darker, slightly opaque in the center, the core of the agar appeared as a multitude of irregular, minute, dew-drop spots. Soo recognized them as mature cultures. He slipped the cork out of the bottle and scooped it across the surface of one of the latter, corked it and wiped it clean on a convenient cloth.

Then he had whirled back to the anteroom, pulling the plague room door shut behind him. Bending down, he placed the precious vial in the top of his sock, slipped through the curtain door and locked it again. A glance down the passageway showed it was still empty. He darted back into Dr. Chang Lin's office. The whole move had taken scarcely more than a couple of minutes. The spy drew a deep breath to still his pounding pulse. A loud knocking came from the closet door. Soo Yong moved listlessly over to it to unfasten the catch.

He blinked questioningly up at the flushed suspicious face of Dr. Feng. "You wished, sir, for me to open this?" he asked.

The doctor frowned. He seemed on the point of accusing the houseboy of having locked him in. He opened his mouth, closed it again. Reading the thought behind the doctor's squinted eyes, Soo could see that the man had been deceived by his vacuous, inquiring expression.

"Why did you not open it when I asked you to?" the doctor demanded.

"I did not know, sir, that you wished it. At first, I did not notice that the catch was on the outside," said Soo Yong apologetically.

"Yes?" grunted the doctor, recovering his composure, "I guess I forgot for the moment that the door was sound proofed." He opened it again and tried the holdback to see if it would slip. "Funny—seems to work all right now."

Stepping back into the closet, he gathered up several bottles and instruments. Soo returned to his chair, watched the doctor passively. Footsteps sounded in the passageway and a moment later several more of the laboratory staff came into the office, talking excitedly among themselves about the growing menace of the Dragon Brotherhood.

"Dr. Chang Lin has asked me to show you out to the campus when Feng has finished patching you up," said one of them. He examined the bruised shoulder. "You didn't get off so easily at that, did you? But don't worry, Dr. Chang Lin is not one to forget favors. He has already departed with his daughter. He wants you to report to him at his home office when you have returned to the house."

He and Feng joined in the discussion of the Dragons. Feng, the incident of the locked door apparently forgotten, made quick hypodermic injections about the wounds. The fluid stung, but when the doctor commenced sewing and dressing the knife gash there was no feeling. Feng also took a few stitches in the shoulder.

"All right, you'll be as good as new in a few days," he said when he had finished.

"I will be forever in your debt, sir," said Soo Yong humbly.

He bowed his way out of the office as he followed the assistant who was to escort him out of the laboratory. Leaving the door of the latter, he hurried down the path to the servants' entrance of Dr. Chang Lin's home. Lung Hi and a group of men from the kitchen awaited him in the basement hall to learn of his adventures.

"My weakness from my wounds is very great," Soo told them. "The doctors say I must have quiet and rest for the present." He continued on back to his room.

Lung Hi, guessing from his furtive signal that he wished to talk with him alone, loudly ordered the kitchen staff back to their labors. Soo Yong was seated on the edge of his bed when the assistant houseman joined him. He endeavored to think of some logical excuse for leaving the room and its ever vigilant visicell in order to pass the cultures and a message to his superior to Lung Hi.

Lung solved his problem by exclaiming: "Your clothes, my nephew, are in ruins. Come, I must get you a new uniform. We cannot have you looking like a beggar."

Soo rose to follow him. But instead of leading the way to the supply room, Lung Hi drew him into a small

closet at one side of the basement hall. "There are no visicells in here," he whispered. "Tell me—you have the look of one who has made great strides."

"I have the culture," whispered back Soo Yong.

"The hell you have!" gasped No. 548, momentarily shedding the identity of Lung Hi, the assistant houseman. "I'll be frank, I didn't think you could do it. Didn't think anybody could do it. But you can tell me about it later."

Soo handed him the vial. "This is to be sealed hermetically at the first opportunity. And you will send this message: 'Large quantities of cultures on hand. Several hundred antitoxin bearing horses in stables of laboratory. Can do little more for the present. No. 2000 L—V.'"

Lung Hi secreted the bottle inside his shirt. "I will let you get your own clean uniform, my nephew," he said tersely. "This will go at once. I must take my chances on explaining my absence when I return. Did anyone suspicion you in the laboratory?"

"Not to the extent of my stealing the cultures."

"Good—I will see you this evening."

They left the closet. Lung Hi got his hat and jacket and slipped quietly out the servants' entrance. Soo Yong continued on across the basement hall to the supply room, little realizing that this had been the last time he would ever see the little operative alive.

Obtaining a clean uniform similar to the torn one he was wearing, Soo returned to his room and changing into it, carefully combed his hair before going up to the office of Dr. Chang Lin in the front of the house. As he came to the waiting room outside the office, he was just in time to see two dignitaries, one of them wearing the drab uniform of a general of artillery, being ushered in by Chang Lin's secretary.

Since Soo Yong's orders were to report here, there was nothing for him to do but wait until the visitors had departed. He seated himself in one of the rather uncomfortable chairs. Half an hour dragged past. He wondered if Lung Hi had yet delivered the cultures to No. 533, the supposed student of aeronautics. Soo had an idea that Lung Hi might have been planning to smuggle the cultures out of the University himself.

Precious time would be saved by such a course. And since outgoing servants were subject to only a very superficial search, there was little probability of the vial being discovered. Even so, Soo Yong found it hard to compose himself. Not until word had been flashed back that Dr. Breckenridge had personally received the bacilli would his task be finished.

If they should fail to go through, then he would be faced by the prospect of endeavoring to obtain the cultures again. Thinking back over the afternoon, it was easy for him to see that an unanticipated sequence of events had made the coup possible.

With a sinking heart he realized that it was now too late to divide the vial, saving one portion for later delivery in case of accident to the first. Perhaps Ken Jin of the Good Will Employment Agency would think of it? Yet if he did? Soo Yong had a fearful thought. In his ignorance of the malevolency of the germs, the operative would be very liable to contract the Purple Plague himself!

Soo half rose to his feet, thinking he might yet overtake Lung Hi. No, it was too late for that now. The air of the room seemed stuffy to him. He wiped his perspiring brow with the palm of his hand.

Two hours or more dragged interminably by. Soo Yong slumped feverishly in his chair when the door to Dr. Chang Lin's office finally opened and the dignitaries took their leave. With an effort, the spy roused himself to come to his feet and stand bowing while they passed him.

The secretary motioned for him to enter the office. Dr. Chang Lin sat behind a great crystal table. Except for this single piece of furniture, the room was furnished in extreme simplicity. Soo Yong stopped before the table, bowing low, waiting for Chang Lin to speak.

The old scientist regarded him contemplatively. "I find myself greatly in debt to you, my servant," he said at last. "And I have been searching my mind for a suitable manner in which to reward you."

"The honor in serving you was sufficient," said Soo Yong, looking squarely into the Lord Ruler's keen old eyes. A sudden weakness claimed him, a strange warmth numbed his limbs.

"Sit down, my servant, you are weak," said Chang Lin quickly. "I forget that you have been wounded."

Soo Yong slumped into the nearest chair, held himself erect with an effort. The muscles tensed in his throat.

"An honorarium alone, I fear would be an unsubstantial gift," continued Chang Lin. "My daughter tells me that you have an interest in books. For this reason, I am wondering if you would care to undertake, beside your duties here, to enroll in the University?"

"It would be with the greatest pleasure, your honor," said Soo Yong huskily.

The Lord Ruler stared at him queerly. "You are sick, my servant?"

"It is nothing," whispered Soo Yong. An unbearable pain shot through his neck and shoulders. His head was drawn back. His knees pulled up in a spasmodic effort. His sight blurred. As through a misty veil, he saw Dr. Chang Lin leap to his feet and jerk the cord that summoned his secretary. The doctor leaned over him, lifted him from the chair.

"You wish me, your honor?" the secretary was questioning.

"Hurry—help me here. The man has contracted the Purple Plague!" hissed Dr. Chang. Soo Yong attempted to struggle up, dropped back again in a spasm of torment as the world went black before his eyes.

IT was four days later before the spy's fever broke and he came back to a world of reality from one of tormenting imagery. His first impression was one of sinking in some unresisting fluid, of terrible weakness. Then as his vision cleared, he saw that he was lying on a narrow bed, the end of which was carved with the gold and black insignia of the counselors.

For a moment he thought that he still suffered from the hallucinations which had haunted his tortured sleep. He strained to turn his head in an effort to gaze about him. The bed still persisted. Then he saw that he was in a great blue-toned room furnished in the manner of Lord Ruler's guest suites. He breathed deep of the fragrant air. From the curtain above him the warm rays of the sun filtered through from the quartz glass ceiling.

Soo Yong twisted his head to the other side to see the uniformed figure of a man nurse writing at a small table. It came back to him then, his fainting away in Dr. Chang Lin's office.

The Purple Plague!

He had had it, was recovering. Must have been in-

noculated directly into the blood stream through his wounds. That would account for his having been taken down by it so rapidly. Prompt serum treatments, no doubt, had saved him. Yet why was he in this suite reserved only for royalty and near royalty? Surely his rescue of Nadja had not merited such treatment? What had become of her? He closed his eyes, striving to remember. The nurse rose from his chair and came to the side of the bed.

"Your honor is very weak. You must try to sleep," the man said.

His honor? Soo Yong knitted his brow painfully. Was this only another phase of his nightmare? The nurse was holding a glass to his lips. He gulped down the medicine. It was bitter. He lay back thinking, piecing his worried thoughts into their proper sequence. Presently, he drifted off into an uneasy sleep.

When he waked again, he felt much stronger. A doctor was in attendance.

"You are recovering nicely, your honor," the doctor said. He felt his pulse.

Soo Yong struggled up on his pillow. "I do not understand—why am I here?" he asked.

The doctor shook his head. "You must rest. Regain your strength," he replied. He would say no more.

Soo Yong sank back on his pillow, strangely at loss. The doctor left shortly, saying he would be back the next morning. Soo essayed to draw the nurse into conversation, to learn the reason for his being in the suite. He asked if he might see Lung Hi. But the nurse, like the doctor, only shook his head.

The spy gave it up finally to lie back wondering if the cultures had gotten through the lines. If he could only see Lung Hi? But for all the deference of his treatment, he seemed shut off from the world as certainly as though he had been a prisoner. Perhaps he was a prisoner? Still, a prisoner would hardly be lodged in such a manner.

He ate with relish the broth which the nurse brought him. During the afternoon he dozed, to awake late in the evening. While he lay there silently cogitating after having eaten his dinner, he saw the nurse draw suddenly erect. A guard pushed open the door.

The thin figure of Dr. Chang Lin entered, a queerly ominous figure in his heavy gown of black and gold. He dismissed the nurse with a softly spoken order, then came to the side of the bed, his hollow face inscrutable as he gazed down at the spy.

"Good evening, Dr. McCarthy," he said gravely.

Soo Yong reared up from his bed, endeavoring too late to mask the startled horror which claimed him. His weakness had undermined his self-control. He dropped back weakly. "You must be mistaken, your honor," he mumbled.

"There is no longer any use of pretense," said Chang Lin. "We know now that Soo Yong and his excellency Lieutenant General Arthur M. McCarthy, second ranking assistant to my most worthy contemporary, Dr. Breckenridge, are one and the same. One of the unfortunate attributes of the Purple Plague, my most estimable servant, is a stage of incoherence and delirium. While in this stage, it became apparent that you were an associate of Dr. Breckenridge.

"With this information to work upon, it was no great labor for our agents to connect you with the absence of Dr. McCarthy from the Federal Hygienic Laboratories. Fingerprints which you had carelessly left on a ray plate there, were obtained and televisioned here, making your identity positive."

McCarthy, staring up into the old scientist's jewel-hard eyes, knew that Chang Lin was telling the truth. Knew, also, that his days were numbered. He felt a curious resignation to his fate. At least, there would no longer be any need of deceit and constant subterfuge. If he could know that the cultures had been successfully delivered, he would be willing to face whatever destiny lay in the unknown.

Then as he pondered the weird skein of life, it came to him with numbing shock that it was not himself alone who awaited court martial as a spy. As his uncle, Lung Hi must already be under suspicion.

"I hope," he said, "that those whom I tricked into serving my ends will not be censored unduly?"

"You refer to the estimable Lung Hi, and Ken Jin of the Good Will Employment Agency?" suggested Chang Lin.

"They should not be made to suffer for my duplicity."

"They will not suffer, I promise you. Never again!" said Chang Lin grimly. "For they were both tried by court-martial, found guilty, and beheaded yesterday, with the setting of the sun."

McCarthy's dark eyes widened in agonizing remorse. "Poor old Guido Geiger," he whispered hoarsely.

"He was a spy."

"I am a spy."

"It is my deepest regret," said Chang Lin with true sincerity. His gaunt face tensed. "Whatever my feeling toward your countrymen as a race, a feeling which you must grant me is justified in view of the malignant treatment of my fatherland in its days of sorrow, I would, notwithstanding, be happy to welcome you to my home. Yet under these unhappy circumstances which we now face, I am only a servant of my people. I hope you will understand me, Dr. McCarthy."

"I think I understand," said the spy.

For as Dr. Chang Lin had spoken, it had come to him that this fearful old man, whose deft fingers and probing mind had created the Blue Plague with the subsequent death of the millions of his country's enemies, except for the intervention of the war, would have gone to his maker with no graver stain upon his hands than the blood of the guinea pigs used in his experiments.

Dr. Chang Lin bowed and backed toward the door. "The price of your freedom, Dr. McCarthy, is not in my hands," he said with an air of regret. "Yet in other things, your slightest wish shall be my servants' command."

"My thanks are many—but I am already treated more richly than I deserve," answered the spy.

He gazed up at the sun screen in morose musing. Chang Lin, in pursuance of what he considered his duty, had caused the death of millions of the Entente's enemies. While for his part, the spy, who had been Soo Yong, had unwittingly caused the death of his own loyal helpers. Who was to be blamed? The war alone? Lung Hi and Ken Jin, what must they have thought of him as they knelt by the beheader? McCarthy closed his eyes in agony, a fine sweat drenching his feverish temples. What would he be thinking when he knelt there, perhaps in the very spot where they had died?

If he could only know that they had not died in useless struggle? If he were only assured that the cultures were in Dr. Breckenridge's office, such a death

would not be without its recompense. That there was no way of his finding out made it the more tragic. Chang Lin had made no mention of the cultures. McCarthy dared not ask, dared not give any clew that the Caucasian Allies might be preparing to cope with the Purple Plague.

He went to sleep finally after the nurse had given him a sedative.

The morning sun shone warm and golden through the screen above him when he awoke. He was still very weak. He ate his breakfast in gloomy silence, afterwards asking the nurse to bring him something to read. Propped up in the bed, he listlessly thumbed the pages of a newspaper, when a gong tinkled, announcing that a visitor waited in the hallway.

McCARTHY wondered who could be coming to see him. An intelligence operative most likely. He'd get little for his pains. The spy's jaw set resolutely. The door opened. A tremor ran through his palsied limbs as he saw the blue-cloaked little figure of Nadja.

Her wide eyes gazed into his with infinite sadness. He wondered at the paleness in the soft oval of her cheeks. The nurse went out to close the door behind him. The girl was suddenly ill at ease, bowed gravely.

"You will pardon my boldness, Dr. McCarthy?" she asked, barely above a whisper.

Looking at her, the spy knew, with a terrible longing, that he did not want to die, that he was young, and that there was much in life which he had missed in the solitary rôle of a student. The knowledge of his brief lease on life lent him boldness, a desire to say those things which had been impossible before.

"I am in a very forgiving mood this morning," he said with forced lightness. Then his voice, too, sank to a whisper. "Besides, I would forgive you anything, Nadja."

She gave a quick little gasp, looked deep into his eyes. McCarthy saw that she was crying. He struggled over the lump that rose in his own throat, managed a twisted smile.

She stepped closer to the bed, paused uncertainly. "Even the fact that it was through me that you contracted the Purple Plague?"

"That was no fault of yours."

"You say it—as though I were an unseeing child," she protested.

He wanted to tell her the truth. Wanted to tell her what her presence meant to him. Instead, he reached out to grasp her hand as it rested lightly on the coverlet. She made no attempt to withdraw it. His pulse speeded giddily as she looked down at him. He sought for words to express himself, realized finally that words were not needed. How long the fusing spell of understanding held them, he had no way of knowing. The nurse walked across the room behind them.

They might not have heard him except for the gentle swish of the closing door. Nadja withdrew her hand, clenched her tiny fists against her breasts. "They cannot—I will not let them take you before the court-martial!" she whispered fiercely.

"It is no use to fret over one's fate," he said, shaking his head. "There is only a certain amount of formality that keeps me from the beheader now. I imagine the guard is doubled in the hall?"

"Guards are everywhere!" she admitted with a tremulous sob. "I have tried to bribe my servants. Have begged my father to hide you away. He would not hear me! But there must be some way. There has to be some way!"

McCarthy continued to shake his head. The excitement had sapped his small store of strength. His head sank in his pillow, a strange, distant roaring in his ears. Yet his head seemed clear enough. He could not understand it. Nadja noticed that he strained to listen, nodded.

"I hear it, too," she said dully.

"I thought at first my fever might be coming back. It sounds as though it were directly overhead. Surely no aircraft are allowed over the University?"

She listened intently, frowned. "It must be the air patrol." Such an explanation was hardly satisfactory. She pulled the cord that cleared the curtain from the ceiling windows. The sound grew louder, a roar as of water pouring over distant falls. Nadja moved over to look out a sliding pane. McCarthy stared after her as if fearful of her leaving. She peered up into the cerulean depths of the morning sky for a moment, then returned to his bedside.

"There seem to be no aircraft within sight," she said.

Abruptly from the dome of the heavens above them, there broke out a veritable chaos of muffled explosions. McCarthy's lean face lighted, his eyes narrowed. He drew a quick breath. Could it be possible? He rang for the nurse.

"See if you can obtain a Marlin disk for me, immediately," he ordered.

Nadja stared at him unable to account for the sudden change which had come over the spy. The distant explosions grew in intensity. The nurse wheeled in a long silver tube with an oval plate set in the base of it. McCarthy pulled himself over to the side of the bed, grasping the arm which Nadja lent him for support. In the mirroring face of the oval, reflecting the depths of the sky, there swam a multitude of tiny dots. Dots that shot hither and yon like electrons in a disturbed orbit.

"What is it?" she asked.

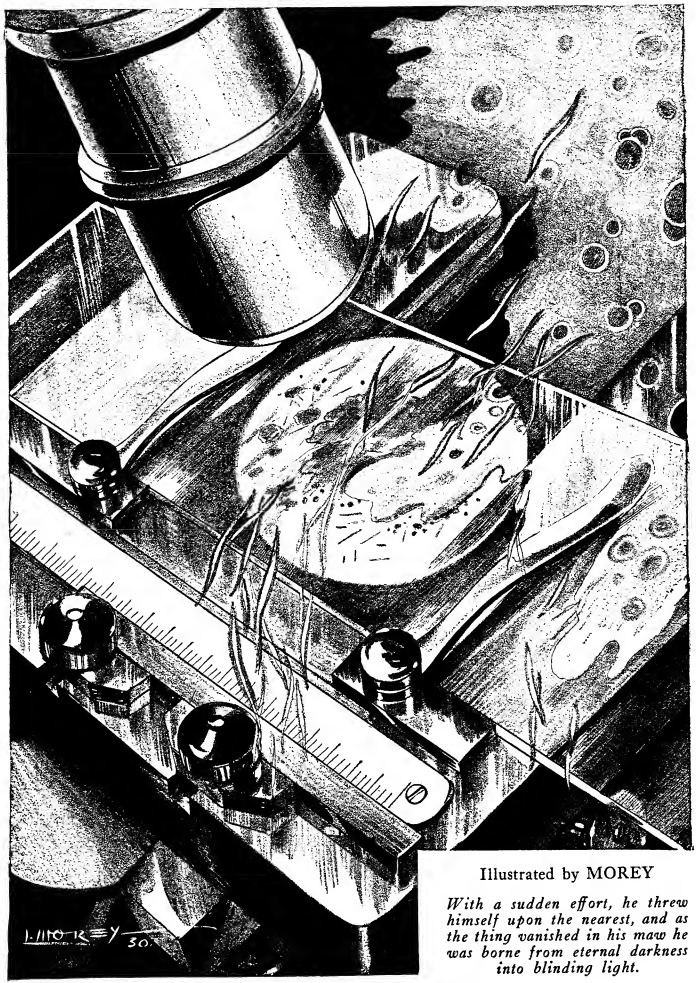
McCarthy's lips were grimly musing. "If I am not mistaken," he said, "New Hankow is being attacked by the combined air forces of the Caucasian Allies." His dark cheek pressed close against her full pink one as they bent over gazing, fascinated, into the disk.

THEY saw, of course, only a small front of the now famous Battle of New Hankow. This battle, which broke the backbone of the Far East Entente, occurred as we all know, above the city from which it derives its name on the morning of March 14, 1981. Because of its close relationship to the menace of the Purple Plague, however, a few salient features of it are worthy of review.

It was precipitated, as is not generally known, with the receipt by Dr. Breckenridge of a brief message accompanying cultures of the Purple Plague from intelligence operative No. 2000 L—V stationed in New Hankow. Realizing after a few hurried tests of the bacilli that it would be impossible to produce an adequate supply of serum before Dr. Chang Lin would be ready to release the plague, Dr. Breckenridge saw that the only logical way of postponing this catastrophe would be to destroy the hundreds of antitoxin bearing horses in Dr. Chang's laboratories.

Accordingly, during the afternoon of March 12, 1981,

(*Continued on page* 1023)



Illustrated by MOREY

With a sudden effort, he threw himself upon the nearest, and as the thing vanished in his maw he was borne from eternal darkness into blinding light.

By A. Hyatt Verrill
Author of "Beyond the Green Prism," "The Non-Gravitational Vortex," etc.

The Exterminator

IT isn't because this story is so short that we don't say much about it in this introductory note, but because it is such a complete change from anything Mr. Verrill has ever written, that we want it to come as a surprise to our readers, as it was to us.

HE was a magnificent specimen of his kind. Translucent - white, swift in movement, possessing an almost uncanny faculty for discovering his prey, and invariably triumphing over his natural enemies. But his most outstanding feature was his insatiable appetite. He was as merciless and as indiscriminate a killer as a weasel or a ferret; but unlike those wanton destroyers who kill for the mere lust of killing, the Exterminator never wasted his kill. Whatever he fell upon and destroyed was instantly devoured. To have watched him would have been fascinating. A rush, as he hurled himself upon his prey, a brief instant of immobility, of seeming hesitation, a slight tremor of his substance, and all was over; the unfortunate thing that had been moving, unsuspicious of danger, on its accustomed way had vanished completely, and the Exterminator was hurrying off, seeking avidly for another victim. He moved continually in an evenly flowing stream of liquid in absolute darkness. Hence eyes were non-essential, and he was guided entirely by instinct or by nature rather than by faculties such as we know.

He was not alone. Others of his kind were all about and the current was crowded with countless numbers of other organisms; slowly moving roundish things of reddish hue, wiggling tadpole-like creatures, star-shaped bodies; slender, attenuated things like sticks endowed with life; globular creatures; shapeless things constantly altering their form as they moved or rather swam; minute, almost invisible beings; thread-like, serpentine or eel-like organisms and countless other forms. Among all these, threading his way in the over-crowding warm current, the Exterminator moved aimlessly, yet ever with one all-consuming purpose—to kill and devour.

By some mysterious, inexplicable means he recognized friends and could unerringly distinguish foes. The reddish multitudes he avoided. He knew they were to remain unmolested and even when, as often happened, he found himself surrounded, hemmed in, almost smothered by hordes of the harmless red things and was jostled by them, he remained unperturbed and made no attempt to injure or devour them. But the others—the writhing, thread-like creatures; the globular, ovoid, angular, radiate and bar-like things; the rapidly wiggling tadpole-like organisms—were different. Among these he wrought rapid and terrible destruction. Yet even here he exhibited a strange discrimination. Some he passed by without offering to harm them, while others he attacked, slaughtered and devoured with indescribable ferocity. And on every hand others of his kind were doing the same. They were like a horde of ravenous sharks in a sea teeming with mackerel. They seemed obsessed with the one all-consuming desire to destroy, and so successful were they in this that often, for long periods, the ever moving stream in which they dwelt would be totally destitute of their prey.

Still, neither the Exterminator nor his fellows appeared to suffer for lack of sustenance. They were capable of going for long periods without food and they cruised, or rather swam slowly about, apparently as contented as when on a veritable orgy of killing. And even when the current bore no legitimate prey within reach of the Exterminator and his companions, never did they attempt to injure or molest the ever present red forms nor the innumerable smaller organisms which they seemed to realize were friends. In fact, had it been possible to have interpreted their sensations, it would have been found that they were far more content, far more satisfied when there were no enemies to kill and devour than when the stream swarmed with their natural prey and there was a ceaseless ferocious urge to kill, kill, kill.

At the latter times the stream in which the Exterminator dwelt became uncomfortably warm, which aroused him and his fellows to renewed activity for a space, but which brought death to many of the savage beings. And always, following these casualties, the hordes of enemies

rapidly increased until the Exterminator found it almost impossible to decimate them. At times, too, the stream flowed slowly and weakly and a lethargy came over the Exterminator. Often at such times he floated rather than swam, his strength ebbed and his lust to kill almost vanished. But always there followed a change. The stream took on a peculiar bitter taste, countless numbers of the Exterminator's foes died and vanished while the Exterminator himself became endowed with unwonted sudden strength and fell ravenously upon the remaining enemies. At such times, also, the number of his fellows always increased in some mysterious manner as did the red beings. They seemed to appear from nowhere until the stream was thick with them.

Time did not exist for the Exterminator. He knew nothing of distance nor of night or day. He was susceptible only to changes of temperature in the stream where he always had dwelt, and to the absence or presence of his natural foes and natural allies. Though he was perhaps aware that the current followed an erratic course, that the stream flowed through seemingly endless tunnels that twisted and turned and branched off in innumerable directions and formed a labyrinth of smaller streams, he knew nothing of their routes, of their sources or limits, but swam, or rather drifted, anywhere and everywhere quite aimlessly. No doubt, somewhere within the hundreds of tunnels, there were others of his kind as large, as powerful and as insatiable a destroyer as himself. But as he was blind, as he did not possess the sense of hearing or other senses which enabled the higher forms of life to judge of their surroundings, he was quite unaware of such companions near him. And, as it happened, he was the only one of his kind who survived the unwonted event that eventually occurred, and by so doing was worthy of being called the Exterminator.

For an unusually long period the current in the tunnel had been most uncomfortably warm. The stream had teemed with countless numbers of his foes and these, attacking the reddish forms, had decimated them. There had been a woeful decrease in the Exterminator's fellows also, and he and the few survivors had been forced to exert themselves to the utmost to avoid being overwhelmed. Even then the hordes of wiggling, gyrating, darting, weaving enemies seemed to increase faster than they were killed and devoured. It began to look as if their army would be victorious and the Exterminator and his fellows would be vanquished, utterly destroyed, when suddenly the slowly-flowing hot stream took on a strange, pungent, acrid taste. Instantly almost, the temperature decreased, the current increased and as if exposed to a gas attack, the swarming hosts of innumerable strange forms dwindled. And almost instantly the Exterminator's fellows appeared as if from nowhere and fell ravenously upon their surviving foes. In an amazingly short time the avenging white creatures had practically exterminated their multitudinous enemies. Great numbers of the reddish organisms filled the stream and the Exterminator dashed hither and thither seeking chance survivors of his enemies. In eddies and the smaller tunnels he came upon a few. Almost instantly he dashed at them, destroyed them, swallowed them. Guided by some inexplicable power or force he swept along a tiny tunnel. Before him he was aware of a group of three tiny thread-like things, his deadliest foes—and hurled himself forward in chase. Overtaking one he was about to seize it when a terrific cataclysm occurred. The wall of the tunnel was split asunder, a great rent appeared, and with a rush like water through an opened sluice-way the enclosed stream poured upward through the opening.

Helpless in the grip of the current, the Exterminator was borne whirling, gyrating madly into the aperture. But his one obsession, his all-consuming desire to kill, overcame all terror, all other sensations. Even as the fluid hurled him onward he seized the wriggling foe so near him and swallowed it alive. At the same instant the remaining two were carried by the rushing current almost within his reach. With a sudden effort he threw himself upon the nearest and as the thing vanished in his maw, he was borne from eternal darkness into blinding light.

Instantly the current ceased to flow. The liquid became stagnant and the countless red beings surrounding the Exterminator moved feebly, slowly, and gathered in clusters where they clung together as if for mutual support. Somewhere near at hand, the Exterminator sensed the presence of the last surviving member of the trio he had been chasing when the disaster took place. But in the stagnant, thick liquid, obstructed by the red beings, he could not move freely. He struggled, fought to reach this one remaining foe; but in vain. He felt suffocating, becoming weaker and weaker. And he was alone. Of all his comrades, he was the only one that had been carried through the rent in the tunnel that for so long had been his home.

Suddenly he felt himself lifted. Together with a few of the reddish things and a small portion of his native element, he was drawn up. Then with the others, he was dropped, and as he fell, new life coursed through him, for he realized that his hereditary enemy—that wiggling thread-like thing—was close beside him, that even yet he might fall upon and destroy it.

The next instant some heavy object fell upon him. He was compressed, flattened, unable to move, imprisoned there with his arch enemy an infinitesimal distance from him, but hopelessly out of reach. A mad desire to wreak vengeance swept over him. He was losing strength rapidly; each instant he was becoming weaker. Already the red beings about him had become inert, motionless. Only he and that thread-like, tiny thing still showed signs of life. And the fluid was rapidly thickening, becoming a sticky, syrupy mass. Suddenly the pressure upon him lessened. For the fraction of a second he felt free, and with a final spasmodic effort he moved, reached the enemy, and, triumphant at the last, became a motionless inert thing.

"STRANGE!" muttered a human voice as its owner peered through the microscope at the blood drop on the slide under the objective. "I could have sworn I caught a glimpse of a bacillus there a moment ago. But there's not a trace of it now. I must have been mistaken."

"That new formula we injected had an almost miraculous effect," observed a second voice.

"Yes," agreed the first. "The crisis is past and the patient is out of danger. Not a single bacillus in this specimen. I would not have believed it possible."

But neither physician was aware of the part the Exterminator had played. To them he was merely a white corpuscle lying dead in the rapidly drying blood drop on the glass-slide.

THE END.

The Purple Plague

By Russell Hays

(*Continued from page* 1019)

Dr. Breckenridge issued orders that the entire right wing of the American air forces would advance upon New Hankow the following morning and bomb the University of Sun Yat-Sen.

General Fearing, in command of the right wing, immediately protested that since New Hankow was the base for the Entente air forces, such an attack would be impossible inasmuch as so small a force would be, unable to penetrate that close to the enemy capital. He was able to convince Dr. Breckenridge of this fact. As a consequence, on March 13, Dr. Breckenridge, utilizing the authority with which he was vested as president of Allied Coalition for the first time, gave orders to the effect that the entire air forces on both fronts, as well as those guarding the principal cities, would unite in a attack on New Hankow the morning of the 14th.

That his order was met with no little opposition from headquarters staff on the Western front is well known. To gain the co-operation of the French and German forces, Dr. Breckenridge was forced to reveal the existence of the new plague. Faced by such a crisis, these leaders hastily capitulated.

During the night of March 13, General Meade drew up the orders of the battle. From the first it was evident that the brunt of the battle would be borne by the midget destroyers armed with automatic gas guns for plane-to-plane combat. Because of their enormous speed and the deadliness of their uranium bombs, no larger craft could hope to compete with them. For this reason, General Meade drew up his attacking formation in two waves. The first consisted entirely of midget destroyers. The second was of armored aerocopter racers and bombers.

The Entente were of course, warned by their audio stations of the attack, as soon as the advance wave entered enemy territory. The north wing of the attacking force on the eastern front under the command of General Gluffer, made the first contact with the enemy in the vicinity of New Foochow. Outnumbered, the Allied fleets were driven back with heavy losses along a front of some hundred miles. The fleets broke up to engage in dog-fights with enemy destroyers.

While this battle was in progress, General Meade, in command of the allied south wing, closed in on the aerocopter racers in the rear of the Entente destroyers, downing them and continuing on north to engage the right flank of the enemy. Combining with General Gluffer, he mopped up the enemy center, along a fifty-mile front, and with the remnants of the two commands continued on toward New Hankow.

The forces attacking from the eastern front came up with the enemy some twenty minutes later in the vicinity of Benares. In a fight lasting less than thirty minutes, the Entente fleets were routed but not without extremely heavy losses on the part of the French and English. The enemy anti-aircraft guns were of little use to them. Because of the high altitude at which the attacking forces crossed the lines, it was impossible to do them any great damage. While in contact with the Entente destroyers at lower altitudes, the action was so swift and the planes so many that the gunners were unable to use their audio finders to the slightest advantage.

The retreating fleets of the Entente destroyers, falling back to their base at New Hankow, were reinforced by hastily formed fleets rushed back from the front and from other cities. This force took the air shortly before 10 o'clock, only to be forced to the ground again in some fifteen minutes by the uniting forces from the east and west fronts of the Caucasian Allies.

Anticipating complete annihilation of all their cities, the Far East Entente immediately petitioned Dr. Breckenridge and the council of the Allied Coalition that they be allowed to sign an armistice. This, as is known, was agreed upon with the reservation that the University of Sun Yat-Sen be evacuated and aerocopter bombers be allowed to descend within the range of the anti-aircraft guns for accurate bombing of it.

It is also on record, that during thirty minutes allowed for the evacuation of the University, a giant aerocopter painted in the blue insignia of the Caucasian Allies landed beside Dr. Chang Lin's home to take up two passengers. One of them was a young man who was brought out to the racer on a stretcher. The other was a golden haired, blue-eyed girl, who accompanied the young man.

THE END.

"There will still be room for Adventurers in the years

Twenty Years

Words and Wisdom?

New York City,
May 7th, 1950.

J. Allen Scott, President of the Sunmat Company, a ten-billion-dollar corporation, arrived here by airplane from Alaska this morning, where he closed a deal for several million acres of land for the purpose of growing tropical fruits.

Mr. Scott came here to dispose of five billion dollars worth of Sunmat Co. stock. The money derived from the sale of the stock is to be used in the development work and the building of the largest sunmat factory in the world in Alaska.

"Alaska," said Mr. Scott, "is the logical place to build our sunmat factory; we have practically twenty-four hours of sunshine per day there during the summer and the interior of Alaska is free from fog. My company will make a tropic of Alaska in five years time; this means that millions of acres of land now covered with ice and snow will be available for farming."

Mr. Scott points with pardonable pride to the two thousand acres of land now under cultivation and bearing tropical fruits on the north-west coast of Greenland, all of which has been accomplished in less than a decade when the sunmat industry was in its infancy.

"The discovery of the method of storing the heat rays of the sun, certainly reads like a romance," said Mr. Scott, "had it not been for more than ordinary curiosity of Jim Night, an Alaska *sour dough*, it might have never been discovered; at any rate no scientist ever suspected that the moss that grows so prolifically and even blossoms beneath the snow of Alaska, on which hundreds of thousands of reindeer thrive during the long arctic night, held the secret of storing the heat of the rays of the sun.

"Jim Night was a miner, who mined gold during the summer and lived in a cabin on his claim during the winter: Jim also grew vegetables for winter use which he stored in a cellar beneath the floor of his cabin. To prevent his vegetables from freezing, the first winter he covered them with dried grass gathered from the hillside; nevertheless he lost more than half of his crop through freezing. The second winter he covered his vegetables with moss and to his surprise and delight the vegetables came through the winter without being frosted.

"In the spring, when he cleaned out his cellar, he tossed the moss on a pile of snow that remained the year around on account of it being shaded by the cabin. The snow disappeared in a few hours after the moss was placed on it. This, together with the fact that the moss kept the vegetables from freezing, 'set me thinking,' as Mr. Night put it, so he gathered some of the moss and sent it, together with a statement of his experience, to the Jarves University at Seattle, Washington, where after numerous experiments, it was discovered that a stem of this moss would raise the temperature several degrees above its surroundings. The stem is hollow and is lined with a wax-like substance; and under a powerful magnifying glass it was discovered that the moss stem was filled with minute one-way valves: the heat rays of the sun entered the stem through these valves and the wax-like substance in some manner absorbed or imprisoned the heat.

"When the leaves are removed, the stem absorbs the heat rays of the sun more readily. We are building a factory in Alaska, where the moss stems will be woven into mats twenty feet wide and several hundred feet long. They will be exposed to the sun during the summer and rolled up and stored in especially constructed storehouses until they are to be used. When in use the sunmats are spread upon the soil and left there until they have thawed the soil to a depth sufficient for cultivation. The land is then cultivated and fruit trees planted. The sunmats are laid between the rows of trees to prevent the ground from freezing; during inclement weather the trees are covered with the sunmats.

to come—Enterprising Men will always find it"

from Today

By W. F. Collins

"This method is a success in Greenland where we are growing tropical fruit in the shadow of icebergs and no doubt it will be successful in Alaska.

"At first we shall not attempt to do any farming except upon rolling or hillside land, as the drainage of the water produced from the melting of the snow has not been solved. When it is, we will plant small grain in the valleys and fruit upon the upland.

"An ingenious young research chemist in our employ has found a way to extract the juice of the moss and sea kelp and combine them so that they will absorb the light rays of the sun; some authorities go so far as to claim that this solves the problem of the cold light; however, this is now, and will no doubt be for some time, a much mooted question.

"This new product is known as 'Liquid Sunshine' and it can be used for many purposes. A drop of the Liquid Sunshine will illuminate the face of a clock at night; a door manufacturer in Philadelphia wants the exclusive privilege of illuminating key holes with it; signs, warning motorists of danger ahead, will be illuminated with Liquid Sunshine; also signs at dangerous railroad crossings. Liquid Sunshine will also outline airplane landing fields at night. To some extent it is supplanting the x-ray in diagnosing diseases. The patient enters a dark room, swallows a capsule containing several drops of the liquid. This lights up the patient's interior and the doctor can study the functioning of the patient's internal organs at his leisure. A talkie actress was the first to have her ailments diagnosed by this method and when asked how it affected her she replied that she felt 'All lit up.'

"A poultry man reports that so naturally did a bottle of Liquid Sunshine, placed in his poultry-house, turn night into day, that his chickens kept right on laying eggs and scratching for food, without going to roost, until they began to drop dead from exhaustion. In order to save their lives, he was obliged to remove the bottle of Liquid Sunshine from the poultry house and bury it in a hole in the ground.

"No doubt many other uses will be found for this wonderful liquid.

"In conclusion, I want to say," said Mr. Scott, "that there is no sounder investment in America today than Sunmat stock.

"And another thing," said Mr. Scott, as he arose to depart. "Although the natives of Greenland have been meat-eaters for centuries, they are taking to ripe fruits, as the Eskimos took to Dr. Cook's gum drops."

Professor Reaves, instructor in mathematics at the Victorville University, was asked his opinion of the feasibility of the project. Professor Reaves said: "Since the storing of heat rays of the sun is an accomplished fact, the melting of snow in Alaska, the thawing of icebergs in the Arctic Ocean or for that matter furnishing heat for the entire world is now reduced to a mathematical problem. In other words it is a problem of building plants of sufficient capacity to manufacture a sufficient number of mats to overcome the temperature in winter." Further than this he refused to be quoted.

John S. Bigelow, inventor of the mechanical dancing instructor for beginners and amateur dancers, refused to be quoted on the sunmat topic.

Our reporter remarked that turning Alaska into a tropic is a large undertaking. Mr. Bigelow was thoughtful for a moment and replied: "Yes, just to contemplate the project gives me the 'hebejeebies'."

Now that the heat rays of the sun have been captured, what next? Perhaps some one will devise ways and means of capturing moon-beams and liquifying them and manufacturing that drink our forefathers indulged in so freely a few decades ago known as "moonshine."

THE END

The Man Who Annexed *the* Moon

By **Bob Olsen**

Author of "The Super-Perfect Bride," "Four Dimensional Transit," etc.

IT is only natural that the moon, being the body closest to the earth, should be of particular interest to those writers and dreamers who believe in the possibility of interspace travel. Beyond a doubt the author of "The Man Who Annexed the Moon" is a student of higher mathematics and Einstein, but far from being pedagogic in his story, Mr. Olsen gives us a truly ingenious tale of lunar adventure and travel across the vacuum of space, presenting it all in a thoroughly plausible and easily assimilative manner.

CHAPTER I

Banning's Astounding Proposal

"BOYS! How would you like to accompany me on a voyage of exploration to the moon?" The speaker was Professor Archimedes Banning, and the "boys" to whom he addressed this nonchalant but startling proposal were Colonel Charles Berglin and myself.

Judging from the expression on his face, Berglin was surprised. Not I, however. I had known the alert, though elderly scholar too long and too well to be astonished at anything he said or did.

Professor Banning was a scientific Alexander the Great. No matter how amazing or how stupendous were the feats he accomplished, he was always looking for new worlds to conquer.

To savants throughout the world, Professor Banning was known as *the* authority on the fourth dimension and non-Euclidian geometry.

The general public, however, knew him best as the inventor of the *Spirit of Youth*—the first successful space flyer.

You will doubtless recall the intense interest and excitement which was engendered throughout the world several years ago when the *Spirit of Youth* made its epochal flight around the moon. On that occasion the space flyer, after circumnavigating the moon, had returned to the earth without stopping.

Despite the fact that no landing was made on our satellite, this unprecedented feat demonstrated beyond question the feasibility of interplanetary travel.

The event was all the more notable because the *Spirit of Youth* was piloted by no less a personage than Colonel Charles Berglin, the most famous aviator that had ever lived. Professor Banning acted in the capacity of interplanetary navigator.

It was somewhat of an accident that made it possible for me—an obscure nonentity—to accompany this famous pair on their memorable journey.

Shortly after he had resigned from his position as Professor of Mathematics at Green University in my native state of Rhode Island, Professor Banning had employed me as a sort of mechanical obstetrician for the inventions which were constantly being born in his fecund mind.

I was selected partly because I was a graduate mechanical engineer, but principally on account of the special work I had done in the more advanced and complex branches of mathematics.

Thanks to what Professor Banning was kind enough to call a rare combination of mechanical skill and the ability to grasp the complicated principles and formulas of pure mathematics, I was lucky enough to get this desirable job.

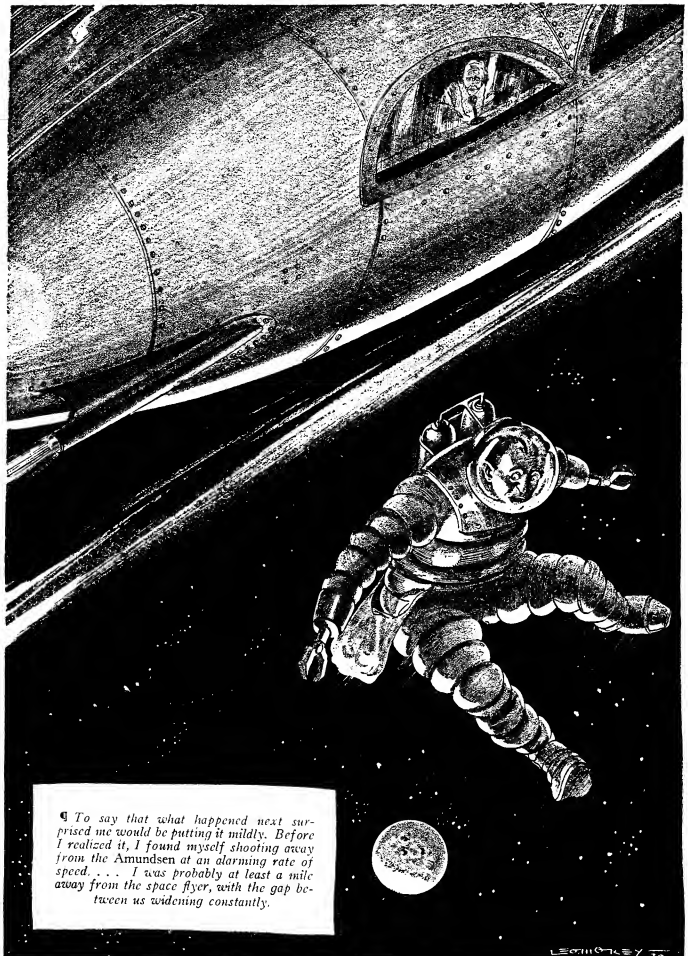
Professor Banning insisted on placing me under a contract. By its terms I received a very satisfactory salary whether or not there was any work for me to do. But the pecuniary compensation was the least of the benefits I derived from this connection. My close association with the learned scholar, besides being a source of pleasure, was a liberal education in itself.

When Professor Banning had broached to Berglin and me his intention of conducting a second expedition, this time landing on the moon and exploring its surface, Berglin's answer was characteristically brief and courageous: "O.K. with me, chief. If you feel sure it can be done and you want my help, you can count on me."

To me was left my customary rôle of critic and objector.

"Do you really think it is possible to alight on the moon?" I questioned. "How are you going to land without crashing when there's no atmosphere to support the airfoils?"

"That's easy," was the Professor's come-back. "We'll use the rocket tubes at the front and bottom of the flyer as brakes. There's absolutely no reason—either theoreti-


¶ To say that what happened next surprised me would be putting it mildly. Before I realized it, I found myself shooting away from the Amundsen at an alarming rate of speed. . . . I was probably at least a mile away from the space flyer, with the gap between us widening constantly.
LEONARD

cal or practical—why we shouldn't light as softly as a feather."

Perhaps I should explain, for the benefit of those who may not have given close attention to the newspaper accounts of its maiden voyage, that the *Spirit of Youth* combined the principle of an airplane with the addition of rocket tubes, which were used for navigating the airless space between the earth and the moon.

MY second question was: "How about taking off from the moon on the return trip?"

"Again we'll use the rockets. You probably know that on the moon everything is much lighter than on earth; consequently the hop-off from the moon ought to be the easiest part of the entire trip."

"But the space surrounding the moon is a perfect vacuum, isn't it?"

"Hardly a perfect vacuum, I'd say. That the moon has no atmosphere even comparable to the more rarefied air at the tops of the earth's highest mountains has been proved beyond the shadow of a doubt, but most authorities believe that the moon has a very slight amount of gaseous envelope. The nearest approach to a vacuum obtainable under the bell jar of a mechanical air pump would probably come pretty close to duplicating the atmosphere of the moon."

"If that's the case, how could we get the door of our flyer open without losing all the air from inside the cabin?"

"I'm surprised at you—supposedly a mechanical expert—asking a question as stupid as that. Haven't you ever heard of air locks? Don't you know it is a simple matter to devise a small chamber with one air-tight door communicating with the cabin and the other with the space outside? Do I need to go any further?"

"No," was my shamefaced reply. "I'll have to admit that was a dumb question, but here's one that I hope you won't think quite so stupid: 'If people have nosebleeds, hemorrhages and become violently ill, just from being in the rarefied atmosphere of high altitudes on earth, what would happen to us if our bodies were surrounded by an almost perfect vacuum? Wouldn't we just blow up and burst—just like the deep sea fishes do when they are suddenly drawn from the high pressures of the ocean's depths to the relatively low pressure of the earth's atmosphere?'"

"That's much better, my boy. I'm glad to see you have some intelligence left. It is quite possible that something like that would happen if we attempted to step forth on the moon without adequate protection. But I've already designed a species of armor or vacuum suit that will easily take care of this contingency. I'll tell you all about it later. Are there any other objections?"

The only one I could think of was: "A contraption strong enough to protect a man against the terrific forces to which he would be subjected would have to be pretty heavy, wouldn't it?"

"Not necessarily, as I shall demonstrate to you shortly. My device ought not to weigh more than two hundred pounds. But suppose it weighs half a ton, what of it?"

"How in the world could anyone but a professional strong man manipulate a weighty and cumbersome contrivance like that without help?"

"If we tried to use such a suit on earth it would indeed be difficult. But don't forget that everything weighs less on the moon. This is due to the fact that weight varies directly with the mass of the attracting body. The moon has only about one-thirteenth as much volume as the earth. On the other hand, the moon is made of lighter material. Using water as the standard, the density of the earth is five point five three and that of the moon only three point three six. From this you can easily figure out that the force of gravitation on the moon is only about one-sixth as great as on the earth.

"This means that if you, when dressed in full armor, weighed one thousand pounds on the earth, you would find it as easy to move around on the moon as if the whole outfit, including yourself, weighed only one hundred and eighty pounds.

"You weigh a hundred and fifty pounds, don't you?"

"A hundred and forty-eight."

"It wouldn't be much of a job for you to carry a load of thirty-two pounds, would it?"

"Hardly."

"But you won't even have to do that. I'm confident that we can make a suit that will do the work and will weigh less than two hundred pounds. That will make you actually weigh about sixty pounds when you start your promenades on the moon. You'll be more likely to be bothered because you'll be too light rather than too heavy, or I miss my prognostication.

"And now have I answered all your questions satisfactorily?"

"Yes, Professor. I'm satisfied."

"If that's the case there seems to be no reason on earth—or on the moon either—why such an expedition is not entirely feasible.

"And think of the glory! What we have accomplished so far is nothing compared with the honor of being the first men to set foot on the moon!"

The professor's enthusiasm was so contagious that there was no escaping the infection. The inevitable happened, of course. Both Berglin and I pledged our support to Professor Banning's enterprise and we immediately started work carrying out the details of his well thought-out plans.

CHAPTER II

The Banning Space Flyer

SINCE the *Spirit of Youth* had demonstrated its efficiency as a space flyer by completing the round trip between the earth and the moon, I naturally took it for granted that our second voyage would be made in the same conveyance.

But Professor Banning had other plans.

"The *Spirit of Youth* is a fine machine," he told me one day. "It was built for a certain purpose and it served that purpose well. But the present task is somewhat different. Our first trip through interplanetary space taught us several lessons and we'd be foolish if we didn't profit by them. I therefore propose to build a brand new space flyer, specifically designed for transportation between the earth and the moon."

Constructing a large machine of original and revolutionary design naturally required a lot of time and cost a lot of money, but neither of these items seemed to bother Professor Banning. Thanks to the royalties which for many years had accrued from the sale of his mathematics text books, augmented by the income from a number of sage investments, Professor Banning was independently wealthy.

For building those portions of the ship which were of conventional pattern, such as the fuselage and landing gear, we used the staff of the Bryan Aircraft Corporation at San Diego, which had been placed at our disposal.

Most of my time was spent in working out the mechanical details of the unique features of the flyer.

While built somewhat on the plan of a large airplane of the enclosed cabin type, our space flyer embodied several revolutionary and peculiar features. One of these was the unusually small proportions of the airfoils, which were less than one-third the ordinary size. Theoretically, we could have dispensed with wings entirely, since the rocket principle of propulsion did not require them. The reason why Professor Banning included small wings as part of his design was that by their aid our craft could be handled more easily and at a much smaller consumption of fuel during the passage through the earth's atmospheric envelope.

The most radical departure from standard airplane design was the elimination of the propeller and of the internal combustion motor. In their place were substituted a system of rocket tubes and combustion chambers which were so simple and so light that they made possible a substantial increase in the pay load.

To the selection of a suitable fuel Professor Banning devoted a great deal of study and research. After he had made hundreds of unsatisfactory tests with various types of gases, volatile liquids and other substances, the problem was solved for him in an utterly unexpected way.

Through a small item in a local newspaper he learned that Captain Frank Sims, one of the world's greatest authorities on high explosives, was living in Los Angeles. Possibly you will remember Captain Sims as the man who originated BRT, the explosive used in the depth bomb which played much havoc among German submarines during the World War.

Professor Banning visited Captain Sims in the hope of getting some suggestions regarding fuel for his space flyer.

He learned that Captain Sims had recently perfected a new explosive which was over four times as powerful as TNT, and which could be handled even carelessly with absolute safety. It was in the form of a fine powder, and was known as radatomite. At the time of Professor Banning's call, arrangements had just been completed for the manufacture of radatomite on a large scale.

When he learned of our plans to explore the moon, Captain Sims not only agreed to turn over to us the first output of his factory at cost price, but also collaborated with Professor Banning in inventing an ingenious and remarkably efficient device for exploding the powder and controlling the discharge through the rocket nozzles with safety and certainty.

SINCE this is not a treatise on mechanics, I shall omit a detailed description of the combustion chambers which Professor Banning and Captain Sims invented for regulating the discharges of radatomite through the rocket tubes. Though ingenious beyond comparison, this device was beautifully simple, and for that reason it functioned perfectly, with practically no likelihood of ever getting out of order.

According to the plans of our space flyer, most of the propulsive force was to be directed through four rocket tubes which terminated at the tail of the ship, all of them pointing dead astern. By means of an ordinary hand throttle, the stream of burning Radatomite could be controlled with marvelous exactitude, ranging from a faint fizz like the discharge of a tiny toy rocket to a continuous blast of expanding gases more powerful than the mightiest of tornadoes.

At the nose of the flyer were four more rocket tubes pointing straight ahead. A separate throttle regulated the radatomite discharges through these tubes, which served the purpose of brakes for use when it was desired to decrease or completely neutralize the forward speed of the flyer. They could even be used for flying the machine in reverse.

For steering purposes two tubes were carried to the tip of the right wing and two to the left. One of each pair pointed forward and the other toward the rear.

In the place of the propeller was a vertical beam, the lower end of which just cleared the ground when the flyer was taxiing. At each end of this beam were two more rocket tubes, one pointed ahead and the other astern.

These eight steering tubes were operated by means of a standard type of airplane joy stick. Pushing the stick to the right would produce currents of exploding radatomite through both the tubes pointing to the rear at the left tip of the wing and the one pointing forward at the right tip—thus turning the nose of the machine to the right. To steer in the opposite direction, it was only necessary to move the stick to the left.

The tubes at the extremities of the upright beam took the place of the elevator, steering the flyer upward or downward according to whether the joy stick was moved backward or forward. When the stick was in a neutral position, no gas whatever flowed through the steering tubes. The strength of the currents produced by exploding radatomite shooting through these pipes was determined by the distance which the stick was moved away from the perpendicular position.

Thus far, with the possible exception of the apparatus for controlling the rate of discharge through the rocket tubes, there was nothing original or revolutionary about the design of our flyer. In its general get-up it was quite similar to other rocket planes which had either been described or planned, or worked out in model form by scientists both in America and in Europe.

There was at least one feature of the Banning space flyer, however, which was absolutely original and unique, and that was the four dimensional steering device.

Constructing the mechanical contrivance which made it possible for the flyer actually to be steered into hyper space was the special job assigned to me.

Though I completed this astonishing task successfully, I was able to do it only because of the cooperation and close supervision which I received from Professor Banning.

I shall not attempt a detailed explanation of this complicated device since—to be perfectly frank—I'm not sure I understand it fully myself—in spite of the fact that I made every bit of it with my own hands.

Fortunately, I was present at a time when Professor Banning was explaining the four dimensional principle to Colonel Berglin, and the following transcript of this exposition is much clearer and more comprehensive than I could possibly make it.

CHAPTER III

Professor Banning Explains the Fourth Dimension

RESPONDING to a request from Colonel Berglin to explain the four dimensional steering mechanism to him, Professor Banning said:

"When you fly an airplane you have three different lines of motion to consider: one you call forward or backward, another left or right, and the third up or down.

"On our space flyer, these three lines of direction are well represented by our three systems of rocket tubes. Motion forward and backward is produced by the tubes at the bow and the stern; motion to the right or left is controlled by the tubes at the tips of the wings, and motion up or down is regulated by the tubes at the extremities of our elevating beam.

"If you imagine lines drawn to indicate these directions, they would be three in number and could be made to point in such a way that any one of them is exactly perpendicular to each of the other two.

"If we measure the extension of our flyer along each of these lines the figure we obtain will represent the three dimensions, length, width and height.

"Further than that the ordinary mind does not attempt to go. But to the trained mathematician it is easy to conceive of a *fourth* dimension, or line of direction, and to place this line in such a way that it is perpendicular to *all* of the lines representing the other three dimensions. Is that clear?"

"I think I get what you're driving at," Berglin answered. "But I don't see how it is possible to draw a line in such a way that it will be perpendicular to three other lines at the same point."

"That's because you've always been accustomed to thinking of things as having only three dimensions. I don't mean to imply that all the things with which we are familiar extend for any considerable distance in the fourth dimension, but I do know that every object in the universe has at least a small amount of four dimensional extension.

"Perhaps I can clarify this point by making comparison with objects which are commonly regarded as being two-dimensional in character—a piece of tissue paper, for instance. We all know that even the thinnest of materials must have some thickness, yet this dimension may be so small in comparison with the other two that a person accustomed only to thin, flat objects could easily assume that the paper had only two dimensions, namely length and width.

"Now suppose this Flatlander should happen to take a large number of pieces of thin paper and pile them on top of each other. Can't you see how he could thus discover the existence of a third dimension even if he had previously had knowledge of only two dimensions?"

"Yes, I can see that plainly enough," Berglin rejoined.

"Well, that's all there is to understanding the fourth dimension. Just imagine a lot of three dimensional objects grouped together in such a way that they extend in a direction that is neither east or west, north or south, nor up or down, but at the same time is at right angles to each of these directions, and you have a clear conception of the fourth dimension.

"When you want to construct a four dimensional counterpart of any particular geometrical figure, all you have to do is figure out how you would construct a corresponding three dimensional article from two dimensional units and your problem solves itself.

"For instance, if you want to build a cube you can do it by piling together a large number of squares of the same size cut out of paper until you have a pile as high as one edge of your original square. Likewise, if you wish to construct a four dimensional cube—which, by the way, is called a tesseract—you can do it by combining three-dimensional cubes.

"Take another example. To make a cylinder out of two dimensional units, all you have to do is combine a large number of pieces cut in the shape of a circle. Hence a four dimensional cylinder would be composed of the three dimensional counterparts of the circles, namely solid spheres.

"To steer our flyer into hyperspace by means of our rocket principle it is necessary to construct tubes having extension in the fourth dimension. If you were a Flatlander and wanted to make a pipe out of tinfoil, how would you do it?"

"That's easy," said Berglin. "I'd make a roll out of it."

I knew at once that this was not the answer the Professor was fishing for and I couldn't help smiling just a wee bit at the look of disapproval which Berglin's common-sense suggestion brought to Banning's face.

"That's wrong!" he shouted. "The minute you bend a roll of tinfoil you get completely out of your two dimensional environment. What I mean is, how could you build a pipe by combining a large number of articles, all of which must be absolutely flat and extremely thin?"

"Oh, I see what you mean now. They'd have to be in the form of rings or washers."

"Exactly! Now you're beginning to grasp the idea. Suppose for the sake of convenience we call your rings or washers hollow circles. Now what sort of units shall we require for building our four dimensional pipe?"

"Hollow spheres, I suppose."

"Precisely. And that's how we made our four dimensional rocket tubes. We combined a large number of hollow spheres in such a way as to make a continuous passageway, through which currents of gases resulting from the combustion of our fuel can be projected, either into or away from hyperspace.

"This sounds simple enough but in actual practice it requires a knowledge of certain principles of higher mathematics which cannot be comprehended except by a person who has spent years in studying them. The difficult thing is to know just how to group the hollow spheres together. You can readily understand that they cannot be placed one in front of the other, one beside the other or one on top of the other, since that would mean merely producing additional extension in either length, width or height. Instead, they have to be placed THROUGH each other and in such a way that the hollow spaces combine to make one continuous hole through which the gases can pass. Do you understand what I mean?"

"I guess I do, but when you talk about sticking together a lot of hollow balls in such a way that gas can pass through the hollow spaces, you're getting way ahead of me."

"That's very simple if you think of these balls as being open in the direction of the fourth dimension, just as a washer or ring is open in the third dimension.

"To a two-dimensional being it would be as impossible to put anything inside a ring as for us to do the

same thing to a hollow ball. Yet one of us can easily pick up a small article from outside and drop it inside the ring. In the same way, by moving through the fourth dimension, you could pick up a pebble and place it inside a tennis ball without making any opening in the rubber. It is also possible to combine hollow spheres in such a way as to form a gas-tight tube."

"That's mighty interesting, even though I'm afraid I don't grasp it completely," Berglin responded. "Your explanation is entirely different from the conception of the fourth dimension I had before. Somehow or other I got the idea that the fourth dimension is time. I remember reading a book called "The Time Machine." It's about a contraption which was supposed to be able to travel in the fourth dimension. With it a man could either go clear back into the days of ancient history or could travel ahead and see how the world is going to be thousands of years in the future."

To which the Professor replied, "Fantastic tales like that are not intended to be taken seriously. They make interesting yarns but couldn't possibly be true. I don't mean to deprecate the so-called scientific fiction stories as a class. Many of them, like 'Twenty Thousand Leagues Under the Sea,' which were originally written as the wildest and most impossible imaginative fiction have already been made real through modern inventions. But when you try to conceive of seeing events long before they actually happen, common sense tells us that even the most marvelous of scientific discoveries could never make such a thing possible."

HERE I took the liberty of butting in on the dialogue. "Excuse me, Professor," I ventured. "But doesn't Einstein's theory of relativity regard time as a fourth dimension?"

"In one sense, perhaps, but that's a mere matter of terminology," he continued. "The essential idea behind the principle of relativity is that every object in the universe is moving. There's no such thing as absolute rest. And since objects move at different speeds, it is impossible to obtain an accurate measure of the distance between two objects unless we know the speed with which each of the objects, as well as the observer, is traveling.

"There's where the time element enters in, and it is sometimes referred to, rather loosely, as the fourth dimension. The term 'separation interval' is a much better word in my opinion, since that suggests both time and distance.

"I don't believe that even Einstein would presume to believe that time is a dimension like length, along which one can travel either forward or backward and at varying speeds.

"On the other hand, the geometrical fourth dimension which I have just explained to you has nothing to do with time. It is a real spacial extension, of exactly the same character as length, width and thickness.

"With one of our four dimensional rocket tubes we shall be able to travel into hyperspace as far as we please, and then, by shooting discharge through the other tube we can just as easily direct our flyer back to three dimensional space.

"You already have some idea of the main purpose behind all this. My object is to use our four dimensional steering apparatus to release us quickly from the grip of gravitation when we want to escape from the earth's pull. On the other hand, we can always return to three dimensional space and to the gravitational fields of the earth or moon whenever such attractive forces will be of any use to us. Is that all clear?"

"I—I—guess so," was Berglin's hesitating response.

CHAPTER IV

The Space Flyer Is Named

IN addition to the four dimensional steering device, our space flyer had another unique and distinctive feature, namely the external lubricating system. This was simply a mechanical device for beating lubricating oil into millions of tiny bubbles and distributing them through small tubes to the exterior of the machine. By imposing rolling, oily contacts between the air and the outside surface of the flyer, this system cut down atmospheric resistance substantially and made it possible to travel through the earth's gaseous envelope at speeds which would otherwise have produced a terrific amount of friction and heat—more than sufficient to annihilate any conveyance which was not protected by this lubricating envelope.

The cabin, of course, had double walls, heavily insulated.

As our task neared completion I began to cudgel my brains for a fitting name with which to christen our mechanical baby. The only cognomens I could think of were either too trite or too commonplace—names like "The Hyphen" because it was to join the moon and the earth), "Excelsior" and "The Spirit of Luna" were discarded because they were too reminiscent of other aircraft which had won fame in bygone days.

One morning I entered the hangar to discover that the name question had been settled without any help from me. Under the direction of Professor Banning, a painter was just putting the finishing touches to the word: ''AMUNDSEN.''

"What do you think of it?" the Professor asked me.

"It certainly is an appropriate name. If Amundsen were alive today, he'd be just the kind of man who would endorse a trip like the one we are going to take. No one who ever lived is more worthy of the honor of having your flyer named after him."

"That's the way I feel about it. I consider your famous countryman as the greatest of explorers—the man who discovered the north magnetic pole and the northwest passage, the first man to reach the South Pole, and the only man so far who has seen one pole and has visited the other one in person. But great as these achievements were, they fade into insignificance when compared to his final voyage into the great unknown, when he sacrificed his life in an effort to save a man whom he considered an enemy.

"That's why I am proud to name my flyer after Captain Roald Amundsen!"

CHAPTER V

The Trial Flight

WHEN the *Amundsen* was almost completed, Professor Banning sent a wire to Colonel Berglin, who was then in Washington attending to his engrossing duties as head of the newly created de-

partment of aviation. Two days later Berglin arrived in his famous "air office."

It was decided first to test the *Amundsen* as a terrestrial flyer without making any attempt to leave the earth's atmosphere or gravitational field. For this reason the four dimensional tubes were not to be used and it was not considered necessary for me to go along. Naturally I was on hand at the time scheduled for the trial flight and I observed the performance from the ground.

Professor Banning and Colonel Berglin entered the cabin and a few minutes later I heard a hissing sound which told me that the rocket tubes were in operation. Evidently only a small amount of power was being used at the start. For several minutes the machine taxied around the field making a series of short low hops. Suddenly, without warning, there shot out of the rear a blast which sent up a great cloud of gravel, and the *Amundsen* leaped heavenward, at a terrific pace. In a few seconds it had reached an altitude of several thousand feet. It then began the most preposterous series of stunts that have ever been witnessed. It looped and it side-slipped; it rolled like a barrel and spun like a top. It ended up by flying upside down in a wide circle, while at the same time it fluttered like a falling leaf, losing altitude at a terrific rate.

I stood rooted to the spot in helpless horror! A terrible accident was about to occur before my eyes! So certain did this seem that I even had a momentary mental picture of the mangled bodies of my two dearest friends lying amid a nightmare vision of twisted steel.

I closed my eyes to shut out the gruesome sight. I held my breath and waited for the crash.

Nothing happened.

When I could stand the strain no longer, I opened my eyes. At first I could see nothing in the air and I concluded that in some inexplicable way the flyer had crashed without making a noise loud enough for me to hear.

But the handful of mechanics and airdrome officials who had gathered to watch the hop-off were all still looking at the sky.

With the aid of my field glasses I was able to discern the unique outlines of the *Amundsen*, sailing majestically upward and onward and apparently under perfect control.

I learned later that the erratic behavior of the *Amundsen* had been due to a slight defect in the adjustment of the mechanism for controlling the blasts through the eight steering tubes. The wild antics performed in mid-air were due to Berglin's attempts to find out what was wrong. He had finally located the trouble just in time to prevent a serious crash. By manipulating the joy stick carefully in such a way as to make allowance for the defective adjustment, he had gotten the flyer under control and thereafter had no difficulty in making it do just what he wished.

After climbing to an altitude of over 50,000 feet in about ten minutes, Berglin coasted back to earth at an abrupt angle. He could easily have gone higher, but that was hardly necessary since the performance of the *Amundsen* was sufficient to prove its fitness for its destined task.

On the downward journey the *Amundsen* approached the airdrome at a tremendous speed. It looked as if it could never land without being carried off the field by its own momentum. But when it was about five hundred feet from the ground, the forward pointing rocket tubes were brought into play. With marvelous rapidity the acceleration was diminished until the machine seemed almost to be suspended in mid air. Then it slowly floated down to earth, settling as softly and noiselessly as a dandelion seed.

CHAPTER VI

Off for the Moon

THE trouble with the *Amundsen's* steering mechanism was quickly remedied and a second trial flight demonstrated that the space flyer was thoroughly fit and ready for its crucial journey to the moon. At this time we also tried out the four dimensional steering device and it proved to be a wonderful success.

After everything had been made ready for the hop-off, Banning timed our departure so that it came when the moon was in its first quarter and was trailing the earth in its journey around the sun. While this was not an essential condition of a successful flight to the moon, it made possible a substantial increase in our speed and a saving of fuel, since it enabled us to take advantage of the motion of the moon itself.

Except for the unusual care which we took in checking over all our supplies and equipment, our take-off was uneventful. Only our assistants and most intimate friends knew about our plans. In order to avoid publicity, we embarked in the small hours of the morning.

The instant we were off the ground, Berglin pointed the nose of our flyer upward at a steep angle and so rapidly did we climb that it took us but a few minutes to reach the highly rarefied portions of the earth's atmosphere.

We were then ready to execute our famous hairpin turn, by means of which we borrowed a tremendous amount of momentum from mother earth and at the same time took advantage of the speed with which the moon was hurtling through space in its journey around the sun.

Following Professor Banning's instructions, Berglin headed the flyer in such a way that it pointed in the same direction that the earth itself was moving.

"Now give her a shot into hyper-space!" the Professor commanded, and I directed a current of exploding radatomite through one of the four dimensional rocket tubes.

Under the circumstances one might naturally expect a violent shock or jar but nothing of the sort happened. Instead we experienced a most peculiar twisting sensation like the skidding of an automobile on a slippery pavement.

For a few seconds we were projected into hyper-space, then Professor Banning said, "By this time we must be pretty well out of the gravitational field of the earth. So you may as well turn the ship about, Colonel."

Following these orders, Berglin operated the rocket tubes in such a way as to make a wide U turn, bringing the nose of the flyer around so it pointed straight toward the moon and in the opposite direction from that in which the earth was moving.

Perhaps an analogy will make the purpose of this maneuver clear.

Imagine a boy on skates being towed across a frozen lake by a horse traveling at the rate of twenty miles

per hour, and being followed at some distance by his dog who is running at exactly the same speed as the horse; that is, twenty miles per hour.

The boy lets go of the tow rope and, without making any effort to increase his speed, executes a hairpin turn so that he faces toward the dog. It is apparent that he will now be approaching the dog at a speed equal to the dog's velocity added to the original velocity of the horse, or with a total speed of forty miles per hour. Naturally he will lose some momentum in making the turn and also in coasting after the turn, but it will require only a relatively small amount of effort on his part to make up for this loss of momentum.

In our case, the earth took the part of the horse, the space flyer was the boy, and the moon was the dog. The tow rope which fastened us to the earth was the force of gravitation. When we projected ourselves into hyperspace, we virtually cut the rope. After making the hairpin turn, we found ourselves speeding toward the moon while the satellite was rushing toward us. And since, by that time, we had reached the interplanetary space where there was no atmosphere to create friction or resistance, our momentum was practically equal to that with which the earth was traveling around the sun.

"You may as well shut off the power now," Professor Banning directed. "We can easily coast most of the way. With no atmosphere to retard us, our present momentum should continue indefinitely. Suppose we make a rough estimate of our velocity. At the time we shot off into hyperspace our flyer was making a speed of about a thousand miles an hour. We were also traveling with the earth in its orbital flight at the rate of approximately 66,600 miles per hour. That makes our total speed pretty close to 67,600 miles per hour. At the same time the moon is now rushing toward us a trifle faster than 66,600 miles per hour. We are therefore approaching the moon at the rate of something like 134,000 miles per hour, so we ought to be able to cover the 238,851 miles between us and the moon in less than two hours.

"Of course we could increase our speed still more by using our rocket tubes, but I consider our present rate of progress quite satisfactory. What do you boys think about it?"

"Suits me," said Berglin.

"Me, too," I chimed in.

AS we had hopped off when it was still dark, we were in the shadow of the earth for several minutes. It wasn't long, however, before one edge of the huge spheroid behind us became visible, and a moment later the great blazing orb of the sun peeped at us from behind the earth.

The most spectacular phenomenon of the aurora borealis was insignificant compared with the marvelous play of light and colors which we witnessed as the sunlight filtered to us through the earth's atmospheric envelope. Almost in the twinkling of an eye the sun had leaped clear of the concealing globe and its corona became clearly visible. Old Sol looked as if it had suddenly increased enormously in size. Instead of appearing to be round, it was irregular in size with great jagged tongues of flame shooting out in all directions.

The stars, too, seemed much bigger, brighter, and more numerous than when observed from the surface of the earth. They shone with marvelous splendor against a jet black sky.

It wasn't long before we began to notice the effects of being relieved from the gravitational attraction of the earth. We learned that it was safer to remain seated and to avoid any sudden motion. Once, when I forgot myself and took a quick step in the direction of the water olla or cooler, I shot up into the air like a toy balloon and bumped my head against the roof of the cabin.

After assuring himself that I was not hurt, Professor Banning said, "Here, try these on."

He handed me a pair of sandals made of iron.

"Strap them on so the iron parts are under the soles of your shoes," he explained. "They are magnetized so they will stick to the steel wall of the flyer."

I strapped on the sandals and found to my astonishment that I could walk like a fly, up the walls and along the ceiling, with my head pointing downward.

All three of us noticed peculiar physiological and psychological effects which Professor Banning told us were due largely to the sudden removal of the earth's gravitation to which our bodies had always been accustomed.

A feeling of nausea, like that which a person experiences when he is in a rapidly descending elevator, was one of the most noticeable symptoms. We were also troubled with severe headaches which were no doubt due to expansion of our brains accompanying the removal of gravitational pressure.

Mentally we were all three afflicted with the most excruciating pangs of home sickness. There was something about being away out there in space, thousands of miles from any other solid substance, that made me feel desperately lonesome and melancholy, in spite of the fact that there was no one on earth for whom I cared anywhere near as much as for the two friends who were but a few feet away from me, where I could look at them and converse with them at will. But the marvelous power which the human body has to adapt itself to all sorts of unfamiliar conditions soon enabled us to overcome our disagreeable sensations and mental reactions.

It wasn't long before the half moon ahead of us loomed up with such gigantic proportions that we realized it was time to prepare for a landing.

CHAPTER VII

We Alight on the Moon

WHEN it is recalled that we were approaching the moon at the terrific speed of about 134,000 miles per hour, the difficulty of alighting without annihilating ourselves and our machine becomes apparent.

We could, of course, diminish our speed somewhat by discharging our rocket tubes in a direction opposite to that in which we were moving, but it would have been necessary to start this braking process when we were only half way to our destination, and this would have consumed a great amount of time as well as fuel.

We employed the same principle that a man uses when he boards a moving street car. Everybody knows, that if a person should run toward an approaching vehicle and attempt to hop aboard it as it rushes by, he would be certain to meet with an accident. On the other hand, if he moves as fast as he can in the same direction as the street car is traveling, he has a much better chance to board it safely.

As we dashed toward the moon, Berglin steered with the rocket devices in such a way that we made a wide horseshoe turn around the moon. We were then traveling in the same direction as the moon and at approximately the same speed. I then sent a charge through the four dimensional rocket tube, which brought us into the gravitational field of the moon. This caused an increase in our velocity.

Within a few moments we found ourselves flying swiftly at an altitude of about ten thousand feet above the surface of the moon.

It was then that we began to appreciate the marvelous beauty of the earth's fair satellite. Having gazed at the weird lunar landscapes, gorgeous and cataclysmic in their grandeur, we could easily understand why a noted scientist, whose knowledge of the moon was confined to telescopic observation, made the statement that the earth's satellite is the greatest scenic resort in the Solar System and in many ways the most fascinating object within the confines of the (telescopically) visible Universe.

Though we needed no explanations to appreciate the incomparable beauties of the panorama which quickly unfolded itself beneath us, Berglin and I felt doubly fortunate in being personally conducted by a man of Professor Banning's accurate and profound learning. There seemed to be no subject, scientific or otherwise, of which Professor Banning did not have a thorough and masterful knowledge. He certainly was well informed regarding the moon.

"Do you know, boys," he told us, "it just happens that we have approached the moon from the region nearest to its south pole. Notice that marvelous chain of mountains over there. They are the Liebnitz Mountains. Neison figured out that one of those summits has an elevation of nearly thirty-six thousand feet, which is about seven thousand feet higher than Mount Everest, the highest peak on the earth!

"When you consider that the moon itself is only one forty-ninth as large as the earth and has less than one-fourteenth of the surface area of our planet, you can appreciate how big these mountains are in proportion to the size of the sphere on which they are located. If the moon were expanded to the size of the earth, the Liebnitz Mountains would be at least seventy-nine thousand, two-hundred feet, or more than fifteen miles high!

"Now if you'll look off to the left a little you'll see one of the most interesting sights in the Universe. Those are the Doerfel Mountains. Flammarion called them and the Leibnitz Mountains "the mountains of eternal light." Notice that the Doerfel Mountains are now on the part of the moon which is not illuminated by the sun, yet the peaks are so high above the surface that they actually jut out of the shadow and into the sunlit portion of space above the moon."

With amazement and admiration approaching awe, Berglin and I silently observed these marvels which never before had been beheld at such close range by human eyes. The dazzling beauty of the brilliant, illuminated peaks, as contrasted with the Stygian darkness of the main bodies of the mountains, was accentuated by the fact that they were covered with hoar frost which sparkled and glittered like myriads of gigantic diamonds.

Finally Berglin broke the spell with, "Well, Professor, where shall we land?"

"Do you see that circular formation straight ahead and a little to the right? That is a crater or ring mountain, and is known as Clavius. The space inside the crater ought to be both level and solid; in fact it should make an ideal landing field."

Within a short time we were circling over the crater and Berglin guided the *Amundsen* so skillfully that we alighted safely without the suggestion of a jar or bump almost in the exact center of the ring.

Then an amazing thing happened. When we looked out of the windows expecting to find a ring of mountains surrounding us on all sides, we were astonished to discover that the walls had disappeared completely, and, except for a few peaks which rose from the surface of the interior and which were clearly visible, we found ourselves in what looked like a vast plain extending to the horizon in all directions.

"What in the world has happened to our ring of mountains!" I exclaimed.

"That's easily explained," Professor Banning responded. "The space inside this crater is no less than one hundred and forty miles in diameter. The wall to the west of us is seventeen thousand, three hundred feet high, and the east wall is over three miles high. That sounds as if they ought to be big enough to be seen even at a distance of seventy miles, but the fact of the matter is that, because of the curvature of the moon's surface, the peaks of our mountain walls are actually below the horizon."

"Shall we put on our suits and take a stroll around?" I suggested.

"Not yet," the Professor decided. "I believe we can see all there is to see here without getting outside the space flyer. Suppose we taxi for a few miles toward the west until we come in sight of the mountain wall."

Berglin turned on enough power through the rear rocket tubes to set us in motion and soon we were spinning along in a series of long hops at a speed of about seventy miles per hour.

In about half an hour the peaks of the crater rim hove in sight and a little while later we were able to distinguish the entire wall of hills ahead of us.

"Not much use in trying to do any exploring here," the Professor muttered. "It's just as I expected. Although these ring mountains slope very gently on the outside, their sides are rather steep on the inside. I'd estimate that those hills ahead of us have an inclination of at least forty-five degrees and that's too steep to climb in comfort, even on the moon. I guess we may as well fly out of this crater and land in some place outside where we'll have a better chance to do some real exploring."

"How about flying around to the other side of the moon—the half that is never seen from the earth!" I exclaimed eagerly.

"Plenty of time for that later. What I'd like to do first is to see if we can't solve some of the puzzles on this side of the moon—puzzles that have baffled the selenographers for the past hundred years."

CHAPTER VIII

Caught in a Lunar Trap

"ONE of the first things I'd like to settle," Professor Banning continued, "is the nature and composition of the streaks or rays which no one has yet succeeded in explaining satisfactorily. A

large number of these streaks radiate from the ring mountain Tycho, which is not far from here. Suppose we take to the air—or rather to the ether and see how these streaks look from above at close range."

Pursuant to the Professor's suggestion, Berglin "gave the gun" to our rocket tubes and, without the slightest difficulty, our flyer rose and soared over the walls of Clavius. Tycho is about one hundred and fifty miles due north of Clavius, and it took but a few minutes to cover this distance.

"Shall we set her down?" Berglin asked.

"Not yet," Banning instructed. "Let us fly around for a while and get a bird's eye view of this formation."

It was truly a remarkable sight! Tycho reminded me of a collossal hub from which radiated over a hundred of the remarkable streaks with almost as much regularity as the spokes of a gigantic wheel. There was however a considerable amount of variation in the thickness and length of the rays. The largest of them extended in a northwesterly direction in a line which was remarkably straight. The marvelous thing about it was that it seemed to disregard utterly every obstacle which lay in its path.

Not far from Tycho we saw a ring mountain of considerable size which Professor Banning told us was called Saussure. It did not deflect the large ray in the slightest degree. Up one side of the southerly wall the streak climbed—down the other side, across the interior, up to the summit of the north wall and down to the plain, along which it could be seen, stretching out to the horizon.

Continuing in a northwesterly direction, we gained altitude, so that more and more of the ray came into view. We followed its path to the place where it crossed a large depression which we learned was known as the Sea of Serenity. This so-called sea did not contain any water, of course, although the greenish, silvery luster of its surface created a remarkable illusion that suggested a lake of mercury.

Despite the brightness of the sea itself, the great ray, cutting directly through the middle of it, stood out with dazzling brilliancy.

"That ray is about ten miles wide and over 2,000 miles long," Banning informed us. "It starts at Tycho near the south pole and terminates at the Sea of Cold close to the opposite edge of the moon. The most astonishing thing is its straightness. It's just as if some superior being had laid a flexible rule along the surface of the moon and had traced the ray with ink made of diamond dust."

"It sure does!" was my banal response to my friend's beautiful flight of fancy.

"What do you suppose that streak is made of?" Colonel Berglin asked Banning.

"That's one thing I hope to find out. One of the favorite theories is that these rays started as cracks formed in the surface of the moon when it cooled from a molten state. This is supported by the fact when a glass sphere is heated and then cooled suddenly by plunging it into cold water, cracks are formed which are very similar in character to the rays on the moon."

This prompted a remark from Berglin: "But if they are just cracks, they would be like crevasses or canyons. They look to me as if they are flush with the surface."

"That's true, and the logical explanation is that the cracks were subsequently filled in with some substance which reflects the light. Suppose, for instance that at one time there were rivers and lakes on the moon, which is not only possible but very probable. Suppose that water which had passed over rocks containing soluble minerals had poured into the cracks in the surface of the moon. The water would be evaporated by the heat, leaving the mineral matter deposited in the cracks. After a while the cracks would be filled to the top with material which would be entirely different from the soil around it.

"Another possibility it that the cracks became filled with molten metal which oozed up from within the moon and subsequently cooled and solidified.

"But now that we are here, what's the use of supposing any more? Let's go down there and find out definitely."

We picked a spot in the Sea of Serenity which looked like an ideal place to land. It was as level as a baseball diamond and was covered with a fine, silvery dust. Berglin made a perfect landing, setting the flyer down gently and accurately.

Then something horrible—something totally unexpected—happened. Like a scuttled ship plunging into the depths of the ocean our flyer sank into that treacherous sea of fine dust. Quickly the light was blotted out as the dust covered our windows and engulfed us. Down, down we went until we must have been at least thirty feet beneath the surface. When we finally came to a standstill we had the feeling of being supported on a cushion rather than resting on firm ground.

I leaped to my feet and as I did so the impact of my shoes against the floor sent us down a few feet further.

"My God!" I cried in a voice which must have reverberated with terror. "We're buried alive! What a horrible death! Oh, why did we come on this trip?"

Neither Berglin nor Banning displayed any signs of fear or other emotion, which made me feel rather ashamed of myself after the first shock of fright had passed off.

"Don't get excited," Banning admonished me. "And, above everything, don't lose your head. We've all been in worse scrapes than this before and we've gotten out of them. Just make up your mind that we are going to get out of this one."

"O. K., Professor. I'll try to get a grip on myself," I assured him. "Sorry I lost control of myself. But when I felt myself sinking, sinking—it made me feel so helpless that ——"

"I understand," the Professor said in his most kindly tones. "And now suppose we plan a way to get out of this hole."

"I don't see any reason why we can't fly out," Berglin volunteered. "If this dust is so fine and so loose that it let us sink this far, it ought to be just as easy for us to get through it on the way out."

"That sounds reasonable enough," said Banning. "It won't hurt to try, anyway."

Berglin took his place at the controls and started the rocket motor. Cautiously he directed a blast through the rear tubes. At first we sank a few feet further. This was probably caused by the loosening of the dust behind and beneath us. But as Berglin increased the power, the *Amundsen* began to move forward and upward, steadily gaining momentum until it suddenly burst into the full glare of the lunar sunshine.

"Hurrah!" I yelled. "It worked! We're out of it! We're safe! And now, for the love of mud, let's steer clear out of those blankety-blank seas."

"Where do we go now?" This from Berglin.

"Turn south," was Banning's laconic order.

After we had flown in the direction indicated for a few minutes, Banning said, "See the ring mountain just ahead? That is Rhetius. I think we'll be able to land safely in that level place just to the west of it."

Following these instructions, Berglin set the flyer down and I heaved a sigh of relief as I felt the machine come to rest on solid ground.

"This is almost the center of the lunar disk which is visible from the earth," Professor Banning remarked. "It's a good place to take possession."

"Take possession?" I exclaimed. "What do you mean by that?"

"I mean that I hold a commission which authorizes me to take possession of the moon in the name of the Government of the United States of America!"

CHAPTER IX

Taking Possession of the Moon

WHEN Professor Banning announced his intention of taking possession of the moon in the name of the United States Government, I thought at first he was joking, but he soon convinced me that he was in dead earnest. To me it seemed ridiculous, a futile thing to do—for of what use could a dead, barron, uninviting world like the moon be to any nation?

Knowing Professor Banning as well as I did, however, I felt positive that there must be some strong valid reason behind his seemingly useless act, so I said nothing.

"Well, my boy," Banning said to me in a jubilant voice, "at last the time has come to try out our space suits! What do you say if we go for a little lunar hike?"

"O. K., Chief!" I replied. I tried to speak in a matter-of-fact way, but I am afraid I betrayed the fact that I was suffering a bit from "buck fever". Somehow or other, the prospect of meandering around through the weird, ghostly landscape of the moon was anything but attractive to me. There was nothing to do but go through with it, however, and I would rather have perished on the spot than to have either Banning or Berglin know that I was afraid.

For several reasons, only two space suits were included in the equipment of the *Amundsen*. One reason was that they took up considerable room, and space was naturally at a premium. Professor Banning had also decided that at no time during our trip would be advisable for all three of us to leave the *Amundsen*. Since Berglin was the official pilot of our flyer it was only natural that he should be the one chosen to stay with the ship, at least during our first trial.

The space suit invented by Professor Banning was built on the principle of a pneumatic tire—in fact, the major portion of it was constructed by a prominent manufacturer of automobile tires. The exterior of the suit corresponded to the casing of a tire. It looked for all the world like a well known trade character used in the advertising of a pneumatic tire concern—the Michelin—a man composed of tires cemented together by their sides, so as to give the appearance of a corrugated surface.

These outer walls of the suit were built with extra strength, like the heavy duty cord tires used on large motor trucks. On the inside was a lining of flexible rubber, similar to that used in making inner tubes. These linings were cemented to the collar of the suit with an airtight joint. To the shoulder plate was attached a heavy glass globe which could be screwed on like the helmet of a diver's costume.

A knapsack fastened to the back of the suit contained in very compact space a tank of oxygen, a storage battery, miniature radio sending and receiving sets, a cooling device, and an air-purifying system.

The waistline was encompassed by a wide leather belt fitted with hooks to which were attached a hammer, a drill, a small pickaxe and a large trowel. The belt also contained several pockets which were designed to receive samples of soil and rock to be collected during our exploration.

Before getting into our space suits, Professor Banning and I each donned a union suit made of wool. It had a tight-fitting hood which covered the head and lower part of face, leaving only the eyes and nose exposed. Into this hood were built the earphones and also the microphone of the radio apparatus.

The fabric of the undergarment was interwoven with fine electric wires, like an electric heating pad. Connected with the suit was a cable containing the wires for the heating device, the radio sets and also the apparatus for controlling the air supply and the cooling system. This cable was plugged into the knapsack through an outlet on the inside of the collar.

Having thus prepared ourselves we put on the space suits and Berglin screwed our glass helmets in place. When thus equipped, we each represented a complete plant for existing independently in the airless space surrounding the moon.

The radio enabled us to communicate with each other and also kept us in close touch with Berglin, who had a corresponding outfit inside the *Amundsen*. With our oxygen tanks and our air-purifying apparatus we could breathe comfortably for at least ten hours. If the temperature became uncomfortably low, we could turn on the electric heat—if we found it too hot we could keep ourselves cool by means of our refrigerating device.

For grasping tools, picking up objects, and similar acts, Banning had provided a pair of very ingenious mechanical hands which were operated by grips inside the arms of the suits.

Our airlock was just large enough for one person at a time. Professor Banning insisted on being the first one to use it. Carrying a stick wrapped in bunting, he entered the narrow chamber and closed the door. A few minutes later we heard the grating of the outer door and soon the grotesque form of the professor clad in his outlandish costume came into a position where we could see him through the window of the flyer.

With an unmistakable gesture, he beckoned me to follow him. As familiar as I was with the operation of the radio device, I was so startled that I nearly jumped out of my space suit when I heard his voice in my ear say, "Come on, my boy! It's fine out here!"

I turned the valve which allowed air from the flyer to pass into the airlock. Then I opened the door and stepped into the small closet. Fastening the door tightly, I pressed the button which operated the air pump. When the indicator pointed to zero, I unfastened the outer door and stepped awkwardly out upon the surface of the moon.

I had expected to feel a series of peculiar sensations, but except for a feeling of buoyant freedom, I felt just

about the same as I did when I was inside the *Amundsen*. But when I attempted to stride forth at my usual hiking speed, I suddenly discovered that I was in a new and different environment.

The step which would ordinarily have carried me a yard or so was more like the leap of a kangaroo. It sent me into the air in a rainbow loop which was fully ten feet high and fifteen feet long. It was so unexpected that I wasn't prepared to make a safe landing. My body pitched forward and I landed in a heap, tumbling over and over on the ground before I recovered by balance.

Banning waited until he saw me scramble to my feet. Then, after he had apparently assured himself that I was not hurt, he laughed uproariously. Thanks to the radio, I got full benefit of his hilarity.

In my earphones I heard the Professor's voice say, "Excuse me for laughing, but you looked so comical that I couldn't help it. Your tumble didn't hurt you, did it?"

"Not a bit," I assured him. "I don't blame you for laughing. Guess I did look funny. I feel almost as if I was inside a balloon."

"You'll soon get used to it. But until you do you'd better move very slowly and carefully. Don't forget that the force of gravitation here on the moon is only about one-sixth as strong as it is on the earth."

"It didn't take me long to find that out," was my reply.

With awkward, shambling steps, Banning walked to a spot where there were a number of rocks lying loose on the ground. He gathered together a score of these stones and built a small monument. Then he unwound the bunting from his staff, revealing an American flag, which he placed in such a way that the stones held the pole upright. There was not the slightest vestige of a breeze on the airless moon, of course, so the flag hung listlessly from the staff.

The sight of our national emblem amid the incongruous surroundings of the lunar landscape sent an incomparable thrill of patriotism through me and made my spine tingle. I brought my heels together and raised my mechanical hand to my forehead in a grotesque, but none the less respectful salute. When I took a quick glance over my shoulder, I could see Berglin standing at attention with his face toward the flag.

Professor Banning also saluted, as he pronounced these words in an impressive voice: "I hereby take possession of this land and all the remainder of the land on the moon in the name of the United States of America."

CHAPTER X

The Explosion

AFTER completing the formality of taking possession of the moon, Professor Banning walked westward toward the great ray, which was but a short distance from the place where we had alighted. Cautiously and awkwardly, I shuffled after him. When he arrived at the edge of the glittering streak, he detached from his belt a drill. Then he squatted down, holding the drill in an upright position.

"Take your hammer," he instructed me, "and see if you can hit the head of this drill without cracking the fingers of my mechanical hand."

Following his orders I grasped my hammer and succeeded in striking the drill squarely with the first blow. It seemed to have very little effect. The hammer felt extremely light, which was due of course to the small amount of attraction which the moon exerted on it. After what seemed like over an hour of feeble tapping, I managed to sink the drill down about ten inches.

To my great relief, Banning said, "I think that's deep enough." Fumbling in one of his voluminous pockets he drew forth a small sack. From it he poured into the hole a handful of powder, which I recognized as radatomite, the same explosive as we used for fuel in operating the *Amundsen*.

From his belt he removed a coil of wire with a small cylindrical object attached to one end. This he placed over the charge of explosive. Filling the hole with loose dirt, he tapped it down with the upper end or head of the drill.

Then he said to me, "You see that boulder over there? I mean the one that's about six feet in diameter. Go and fetch it here for me, will you please?"

"You want me to fetch that enormous rock for you?" I exclaimed. "Say, what do you think I am, Hercules, Samson, or some other professional strong man?"

"You don't need to be a Samson to lift that stone. Suppose you go over there and try."

I walked up to the boulder and managed to get a good grip on it with my mechanical fingers. Then I braced myself and gave a mighty heave. Much to my astonishment it came up so easily that it threw me off my balance and I sat down, with the great rock resting on my lap. Had an earthly stone as large as that fallen on me, I would have been seriously crushed beneath the weight of it, but the lunar rock rested on my legs as lightly as if it had been made of cork.

Scrambling to my feet again, I had no difficulty in lifting the rock and carrying it to Banning. He rolled it into a position directly over the hole containing the charge of explosive. Then he walked away, uncoiling the wire behind him.

I stepped back a few yards and stopped to watch, but the Professor continued to put more and more distance between himself and the charge. "Better come over here," he cautioned me. "That's liable to make things fly for some distance."

It was fortunate for me that I heeded his warning. Banning exploded the charge by making an electrical connection with the storage battery which was part of his equipment.

Expecting a loud detonation, I stood with my mouth open. But not even the faintest ghost of a sound reached my waiting ears. Amid a deathly silence the ground seemed to burst open, sending a geyser of glittering lumps high into the air. The huge boulder shot into the air as if it were a toy balloon. But instead of dropping like a similar object would fall on the earth, it seemed to float down, slowly and leisurely. The fragments torn from the great ray behaved in a similar manner, of course. It was fortunate for us that they did descend with moderated velocity, for several of them came so close to us that we had to move quickly to get out of their way. It would have been rather difficult, if not impossible, to dodge missiles like that, had they dropped upon us with the speed of falling bodies on the earth.

His pedagogic training coming to the surface, Professor Banning took this occasion to point out the scientific aspects of this phenomenon.

"You see," he explained. "The effect of that explo-

sion was a great deal greater here than it would have been on earth, because there was a smaller amount of resistance to overcome. The fragments were thrown about six times as far as they would have been back home. This is due to the fact that the force of gravitation is only about one-sixth as strong here as it is on earth. For the same reason, when the pieces started to come down, they fell at a much slower speed than they would have done on our terrestrial sphere.

"The earth's gravitation makes a freely falling body drop a little over sixteen feet the first second. On the moon, the same object would fall only two feet and eight inches during the first second."

"But how come I didn't hear the explosion?" I asked.

"You ought to be able to answer that if you just use your brains. You know, of course, that sound can only travel through a solid, a liquid, or a gas. It will not penetrate a vacuum. The reason you didn't hear any sound was that there was nothing between you and the explosion which was capable of transmitting sound."

"But how about your voice coming to me over the radio?"

"That's altogether different. Radio waves don't need a material conductor. They travel through the ether and there's plenty of ether even on the moon."

"Why, of course, I know that. I just didn't use my head—that's all."

The Professor began to coil the wire.

"Suppose we gather up some of these samples we blew loose," he suggested.

Following Banning's example I picked up a few fragments of the material torn from the great ray. It was easy to recognize them by their silvery, metallic luster.

This accomplished, I asked, "Now, what do we do, Professor?"

"Do you see that ring mountain off there to your left? That is Rhetius. Now that we are here we may as well go over and take a look at it."

"O. K., Professor," I agreed, and started to walk in the direction which he had indicated.

"Hey, there!" He called after me. "Where are you going?"

"I'm going to hike over to that ring mountain."

"Hiking over there? Do you realize that it's nearly a hundred miles from here?"

"A hundred miles from here? Why, it looks as if it's only a mile or two away."

"You must remember that things look altogether different here on the moon. The reason that crater looks so close is that there is no atmosphere between us and it. On earth we judge distances by the relative size of familiar objects and also by the clearness or haziness of the images cast on our retinas. Here the distant objects are nearly as clearly visible as those that are close by. Furthermore, we can only guess at the real size of distant objects and for that reason we can not make comparisons with any degree of accuracy.

"Of course, you could walk over there if you insist. With practice you ought to be able to travel pretty fast—say twenty miles an hour—so it will take you only about five hours to get there. But, for my part, I believe I'll have Berglin taxi me over there. No use exerting myself unnecessarily."

"Count me in on the taxi party, too," I said. "Hiking a hundred miles all by myself doesn't exactly appeal to me, even if I am a much faster walker up here than I ever dreamed I could be."

CHAPTER XI

A Perilous Hike

IN turn, Professor Banning and I entered the *Amundsen* through the airlock. Since the trip was to be a short one, we did not remove our space suits. It took but a few minutes for Berglin to cover the hundred miles that separated us from our objective. Once more the two of us emerged from the space flyer and strolled across the surface of the moon.

As the Professor had anticipated, we found that the external slopes of the ring mountain were not at all steep. I estimated the grade to be approximately five per cent. On the other hand, the interior walls were quite precipitous, ranging from twenty-five to fifty per cent. in grade.

By this time we had become accustomed enough to our new environment so that we could move along at a pretty brisk pace, covering the ground in a series of long leaps. Up the gently sloping sides of Rhetius we hopped until we stood on the rim of the crater.

Here a marvelous sight met our eyes. Rhetius was by no means large compared with some of the other ring mountains. When compared with any similar formation on earth, however, it was a veritable giant.

"This crater is about twenty miles across," Professor Banning elucidated. "Just how big this is can be estimated by comparing it with the largest crater rings on the earth, of which there are only three which can boast a diameter as great as fifteen miles. They are Aso San in Japan, Lake Bourbon on the Island of Luzon in the Philippines, and a crater in northern Kamchatka. There are several large crater lakes in the United States, but not one of them is more than seven miles in diameter.

"Here on the moon there are many ring mountains that are over a hundred miles wide. The largest of all is Bailly. It measures about one hundred and eighty miles across."

As we stood on the rim of Rhetius, we could clearly distinguish the rugged and magnificent outlines of the opposite wall. In the center of the ring was a picturesque cone shaped mountain, which resembled a small volcano within a larger crater.

The colorings of the landscape were gorgeous. Never before had I seen such a riot of purple and green and magenta and orange as were splashed with reckless lavishness all over the incomparable scenery.

For some time we stood there feasting our eyes on this rare vista, then, half reluctantly, half eagerly, we retraced our steps.

Professor Banning was content with leaps of moderate length, covering approximately ten yards at each step. But I, with the characteristic willfulness of youth, must needs attempt to establish a record for a lunar broad jump.

First I tried a few standing jumps and derived a tremendous amount of enjoyment from feeling myself soar up into the air for a height of ten feet or more. I expected to get a jolt when I landed but found that I alighted slowly and gently. This also was due to the fact that my body was being pulled down with only a fraction of the gravitational attraction on the earth.

Next I attempted a hop, skip, and a jump, and found that I could leap both higher and further than from a standing start and still land without trouble. I then decided that I was ready to make a running broad jump

that would far exceed the greatest accomplishments of the world's leading athletes. In this I succeeded with a vengeance.

Because of the difficulty in judging distance in the deceptive airless space surrounding the moon, I did not realize how close I was to the rim of a titanic gorge. When I reached the highest point of my lob, I found myself headed right into the maw of this horrible chasm. I tried to emulate the figure of a cat I once saw in a movie animated cartoon, which jumped off a high cliff and, changing its mind in midflight, pulled itself through the air and back to the top of the precipice.

With me, however, this scheme didn't seem to work very well. No matter how frantically I waved my arms and kicked my legs, I continued to drop with increasing acceleration—straight into the cleft.

Sometimes I marvel at the inconsistencies of the human mind—especially with respect to such qualities as pluck, nerve, and courage. I've heard of men who have repeatedly charged deadly machines gun nests without flinching, but who whimpered like babies when threatened with the cold steel of a trench knife. There are those who have braved the perils of life aboard a submarine, who couldn't be hired to ride in an elevator.

Consider my own case, for instance. But a short time previous I had completely lost my nerve because I feared that we were to be buried alive inside our flyer. My fears turned out to be groundless. And now I was facing a far more serious danger and I wasn't scared in the least. The fact was that I actually joked about my predicament.

I was still dropping through space when I heard in my earphones the voice of Profesor Banning calling my name.

"Are you hurt? Are you hurt?" he kept repeating in anxious tones.

"Not yet!" I yelled into my microphone as I plunged downward into the abyss. "I'm O. K. so far!"

I felt a sharp jolt as the nether portion of my space suit bumped against the steeply sloping walls of the canyon, and again I called out, "All right so far."

As I bounced down, now hitting the cliff, now hurtling through space, I clutched desperately at the precipitous rocks with my mechanical hands. Once I caught hold of something, but the force of my descent jerked my grip loose. However, this served to slacken my speed sufficiently so that I was able to hang to the next projection that came in my path. Finally I brought up with a thud and managed to clamber up upon an overhanging ledge.

You can understand that this feat was all the more difficult because it was performed in Stygian darkness. The instant I had passed over the edge of the canyon the light had been blotted out as suddenly and as completely as if the sun had been totally eclipsed. Considering the fact that the plain I had just left was bathed in dazzling sunshine, it seemed inconceivable that I could be so quickly plunged into darkness so dense that I literally could not see my mechanical fist when I held it in front of my helmet.

THE explanation was simple enough. Without any air, water vapor, or dust to diffuse the light of the sun there was a total absence of illumination in the shadow of the cliff. On the moon there was no light except in those places which were exposed to the direct rays of the sun, or to light reflected from some illuminated surface.

Again I heard Professor Banning's voice calling to me, "Are you all right?"

"I'm still O. K.," I radioed to him. "Right now I'm perched on a narrow ledge of rock somewhere between the top and the bottom of this God-forsaken hole."

"Stay right where you are!" he said. "We'll see what we can do about getting you out."

"Don't worry!" was my response. "I'll stay right where I am until you rescue me. You can absolutely depend on that."

I had hardly uttered these words before the ledge on which I was standing crumbled beneath me, and again I resumed my downward journey. Fortunately I didn't fall far enough to acquire much speed before I landed on a second ledge which felt larger and more secure than the other one.

As I crouched on that narrow projection shrouded in pitchy blackness I could sympathize thoroughly with Homer's fabled Cimmerians, whom he described as living in perpetual darkness. It was lucky for me that I had the assistance of a man as ingenious and as resourceful as Professor Banning. Simple and effective as his plan of rescue proved to be, few other men would have thought of it so quickly.

By way of encouragement and instruction he gave me this explanation *via* radio: "I have my pocket flashlight fastened to an electric cable. I am now going to lower this light over the edge of the cleft somewhere near the place where I saw you disappear. Watch for the light and let me know if I have it headed in the right direction."

I gazed upward and soon saw a tiny point of moving light. "I see it!" I cried. "But you'll miss me by several feet if you keep on lowering it from where you are."

"What direction shall I move it?" he asked.

"A little to the—" I was going to name one of the four points of the compass but when I tried to figure out my relative position with respect to the light, I found myself hopelessly confused. So I foolishly shouted, "Move it over this way."

The Professor must have understood my confusion for he moved the light and then said, "Did I move it closer that time?"

"Sure!" I yelled into my radio transmitter. "But you didn't move it far enough."

"How is that?" he said after he had altered his position.

"That's too far," I told him. "Back this way about six inches. There! Now it's directly overhead. Lower away!"

Closer and closer came that blessed speck of light until I could reach out and grasp the wire in my mechanical fist.

"I have hold of the cable," I called out. "Now what shall I do?"

"Wrap it around your body and fasten it securely, but in such a way that you can slip it off quickly."

"What are you going to do? Haul me out?"

"Why, certainly."

"Do you think this wire will hold the weight of my space suit with me inside it?"

"It ought to. If it doesn't, we'll have to figure out some other way."

"Figure out some other way!" I yelled. "Don't you

realize that if you start pulling me out and this wire breaks there won't be enough of me left to do any figuring over?"

"But I'm telling you that the wire is plenty strong enough to bear your weight. Can't you take my word for that? At any rate, it's the strongest material we have on hand—so it's either the wire or nothing."

"All right," I consented. "But isn't there another danger? Suppose the rubbing of the cable against the edge of the rocks up there wears it so much that it breaks."

"I've thought of a way to avoid that," the Professor said. "I'll have Berglin pull you out with the aid of the *Amundsen*."

At the time he made this statement I couldn't see what difference it would make in the wear on the cable whether I was pulled out by a person or a machine, but when I heard Banning's instructions to Berglin, I understood what he was driving at.

"I'm going to fasten the wire to the undercarriage of the flyer," I heard Banning say. "I want you to rise as slowly as you can. There are several hundred feet of slack, but you'll have to be awfully careful so that you do not bring the wire taut with a jerk."

This sounded like a risky thing to attempt but, thanks to Berglin's superb skill in manipulating the space flyer, it was preformed without mishap. Looking upward I saw the *Amundsen* circling around, gaining altitude by inches until, with an almost imperceptible tug, I was lifted gently into space. There I dangled, like a fish on the end of a line, while the flyer continued to climb.

With a suddenness that blinded me, my head popped from the Cimmerian darkness into the dazzling glare of the sunlight. I had sense enough to close my eyes and then open them very gradually.

When I was clear of the chasm, Berglin slowly descended until my feet were only a few inches from the ground. Then he dived in a steep spiral, thus relieving the tension on the cable. In this manner he deposited me softly and safely on the sunlit plain.

A moment later I had disengaged myself from the cable. By this time my eyes had become accustomed enough to the bright light so that I was able to make out the form of the Professor in his space suit a short distance away. I also saw the *Amundsen* as Berglin set it down nearby.

Hastening to the beneficent protection of the space ship, I quickly entered the airlock and a few moments later was inside the cabin. This was rather inconsiderate of me, since it left the elderly professor the task of coiling the wire which had been used in my rescue. I divested myself of my cumbersome garment and took several deep breaths of air which seemed to taste much fresher than the atmosphere provided by the space suit.

When I glanced out of the window and saw Professor Banning laboring along with the heavy coil of wire, I felt very much ashamed and I hastened to apologize to him as soon as he appeared inside the *Amundsen*.

"Oh, that's all right," he said generously. "I understand your mental reactions perfectly. After the experience you had I could hardly expect you to lose any time in getting to a place which you consider safer."

CHAPTER XII

Our First Night On the Moon

WHEN I had sufficiently recovered from the effects of my harrowing experience, I remarked to the Professor, "That sure was some gully I got myself into. It must have taken millions of years for a cleft like that to be carved out."

"On the contrary," Banning corrected me. "It is more than likely that your little gully, as you call it, was carved out in a few seconds."

"I don't see how that could be possible."

"It wouldn't be, if it were done by water. But I think we can be absolutely certain that water had nothing to do with the making of that cleft. To be sure there might have been a considerable amount of moisture on the moon at some far distant time, but it would have been frozen solid throughout the lunar night, and would have been in the form of vapor during the periods of terrific heat when the sunlight was streaming down on this part of the moon. Under the circumstances, erosion such as takes place on the earth could hardly dig out such a tremendous gash as that.

"I'm afraid that—even after your experience in exploring the inside of yonder cleft, you have no conception of its magnitude. It is twenty miles wide and a hundred and eighty-seven miles long."

"How in the world—or rather in the moon—can you say it is exactly so long and so wide?" I asked in amazement. "I don't remember seeing you measure it or even making an estimate of its size."

"The measuring was done a long time ago by selenographers who viewed the moon from the earth through their telescopes. In some respects we know more about the geography of the moon than we do about certain portions of the earth. It is a simple problem of triangulation to measure the length and width of any object on the moon. And, thanks to the clearness of the shadows, we can also measure the height of mountains and the depth of most of the valleys with equal exactness without leaving the earth."

"But you said a moment ago that the valleys on the moon were not formed by water action, but were carved out in a few seconds. I suppose you mean that the moon must have been hit by another object."

"Precisely. Some authorities think it was caused by a comet hitting the moon a glancing blow and plowing right through the surface. Other selenographers attribute it to a similar phenomenon caused by a meteor. I am inclined to hold to the meteor theory myself."

"Well, whatever it was that caused that gorge to be formed, I've seen all of it I care to, thank you," was my closing comment.

"What's our next move, Professor?" Berglin seemed impatient to keep going.

"I think the next thing for us to do is to get some rest. Do you realize, boys, that it is over thirty hours since we left the earth and none of us has had a wink of sleep?"

It was true. What with the excitement occasioned by our incomparable adventures, combined with the brilliant sunlight and the slowness of the sun's passage across the sky, we had not realized how much time was elapsing.

The idea of taking a rest was decidedly welcome to me. Though I had not felt the least bit tired before, once the thought had been suggested to me I found myself overcome with profound weariness.

"Shall we turn in right here?" I asked.

"If you want to," the Professor replied. "But I think we will find it easier to sleep if we move over to the night section of the moon."

"What!" I cried. "Do you want us all to commit suicide?"

"What do you mean by suicide?"

"That's exactly what we would be doing if we tried to land the flyer in the dark. Believe me, I've been in the moon's darkness and I'm telling you that it's so dark down there that in comparison with it a lump of coal would look like a snowball."

"But you were in a shaded place. My idea was to land in the open but on a portion of the moon where the sun isn't shining."

"Well, if it's as dark as that in the shadow of a cliff, in the daytime, how much darker will it be at night?"

"Don't worry, we'll have plenty of light to land by. You seem to have forgotten our old friend the earth will give us earthlight."

Instinctively I gazed up at the sky. Hanging there motionless—almost exactly in the zenith—was good old Mother Earth. Though we were still exposed to the brilliant light of the sun, the sky was jet black and was studded with myriads of stars. They seemed to be far more numerous and to shine with much greater brilliancy than when viewed from the earth in their most brilliant display.

Our mother planet resembled the moon—but what a moon! Its diameter was four times as large as that of luna as seen from the earth. Our position was such that the earth was in what might be called its last quarter. Only half of it was visible and the remaining portion of its disc was like a huge semi-circular hole cut out of the star-studded background of the sable sky.

The ice caps surrounding the north and south poles were very clearly visible as they reflected the light of the sun with sparkling brilliancy. It was rather difficult to distinguish the conformation of the continents because of the mantle of clouds that hung about the orb, but between patches of the clouds I was able to make out the outlines of the British Isles and of the Scandinavian Peninsula.

Professor Banning went on with his explanation: "When we get over to the dark side of the moon we'll find the country bathed in earthlight. The earth, of course, has its phases, just like the moon. When the earth is full, it reflects to the moon about thirteen times as much light as the full moon sends to the earth. Even with only half the earth illuminated as it is now, we will find that it is about six times as light as it is on a clear night on earth when the full moon is directly overhead."

As usual, Professor Banning's predictions were fulfilled with amazing exactness. With Berglin at the controls we hopped off by daylight and within a short time we had flown into the region of lunar night.

If the scenery of the moon was magnificent in the sunlight's brilliant glare, it was incomparably beautiful in the soft, bluish light of the earth. There was an abundance of illumination and we could easily distinguish even the small objects below us.

WITHOUT the slightest difficulty, Berglin set the *Amundsen* down in the center of the ring mountain, Eratosthenes. It was not until some time later that we learned the reason why Professor Banning had selected this particular spot for our camping ground on our first night on the moon.

Before retiring, Professor Banning took a reading of the thermometer which was especially designed for registering the temperature of the space outside the *Amundsen*. It was minus 137 degrees Centigrade. Reduced to the Fahrenheit scale this represented a temperature of 215 degrees below zero.

For purposes of comparison it may be of interest to mention here that subsequent reading made on the moon ranged from 240 degrees below zero Fahrenheit just after dawn to 218 degrees Fahrenheit at the lunar noon. It will be noted that this maximum temperature is six degrees higher than the boiling point of water at sea level on the earth. In the airless space surrounding the moon, the small amount of water there would change almost instantly from ice to vapor.

In spite of the hollow walls of the *Amundsen* and the heavy insulation between them, the bitter cold of the lunar night soon began to make itself felt within the flyer and we were glad to make use of our electric heating equipment.

Without divesting ourselves of our clothing, we rolled ourselves in our blankets and lay down on our pneumatic mattresses. In a few minutes the labored breathing of my two companions told me that they had quickly fallen asleep. I, too, was physically fatigued, but my mind insisted on staying awake. This was probably due in large measure to the effects of my accident. Through a window in our portable home I could see the earth, hanging there in space like half a gigantic melon. It filled me with the most excruciating pangs of lonesomeness and home-sickness to behold my native planet away out there across that awful stretch of empty space.

It wasn't long, however, before my bodily weariness triumphed over my mental alertness. The subtle glue, of which Stevenson speaks, slipped beneath my eyelids and I fell into a sound slumber.

I awoke to gaze in open-mouthed astonishment on one of the most magnificent spectacles that a human being has ever beheld.

Sunrise on the moon!

To one who has not seen this incomparable sight with his own eyes no verbal description can convey a clear idea of the splendor of the lunar dawn.

Long before the uppermost edge of the sun's disc came into view, its advent was heralded by gorgeously colored shafts of living flame which shot up for enormous distances into the sable and diamond mystery of the star-studded sky. This wonderful phenomenon was caused by the corona of the sun which is visible to observers on earth only at rare moments during a total eclipse of the sun.

Just before the edge of the sun itself appeared, a number of smaller protuberances, fantastic in shape and brilliant pink in color, shot above the horizon.

Between us and these astonishing manifestations of cosmic illumination lay the barren plain, the distant walls of our ring mountain, and the other grotesque features of the lunar landscape, wrapped in the weird spell of the clear blue earthlight.

It was several hours before the entire circumference of the sun was visible to us, yet so wonderful and so

diversified was the show put on for our benefit that none of us seemed to tire of looking at it.

I took enough time to tear my attention away from the eastern horizon and to gaze up at the zenith, where I saw my old friend the earth in exactly the same position as I had observed her the previous evening. At first this astonished me, but a moment's reflection told me that, since the moon always keeps the same face turned toward its mother planet, there can be very little change in the position of the earth as seen from any particular spot on the moon. Such changes as do occur are very slight and caused by the libration or tilting of the satellite in its journey around the earth.

After going through the usual routine of washing, shaving, and of eating breakfast, we prepared to continue our exploration of the moon's surface.

As Banning and I were getting into our space suits, I asked, "By the way, Professor, would you mind telling us why you picked this particular spot for us to spend our first night on the moon?"

To which he replied, "I am anxious to settle as soon as possible certain questions which have been the source of a great deal of guess work and argument on the part of astronomers and selenographers. The most important one is this: Is there any vegetation or other form of life on the moon? I chose this place because the interior of the ring mountain Eratosthenes is one of the regions in which a noted astronomer claims to have detected evidence that some form of vegetable life exists."

CHAPTER XIII

Answering Puzzling Questions

WHEN a traveler is writing about a strange land —describing scenes which have never before been gazed upon by human eyes, there is perhaps a strong temptation to fabricate or at least to exaggerate. It would be easy enough—with the aid of a creative imagination—to describe the moon as covered with monstrous and preposterous vegetation and inhabited with animals—some horrible, some weird, some human-like.

But since this is nothing but a straightforward, accurate account of what we actually saw and did during our sojourn on the moon, I am compelled to chronicle that no life of such extraordinary characteristics does exist on the moon.

We learned that the changes in the color of the plain inside the ring mountain Eratosthenes, which take place as the heat of the sun warms this region, were not due to vegetation—as was erroneously deduced by one or two well known astronomers. It was caused entirely by the effect of the heat on a mineral formation which is metallic in character. Professor Banning secured samples of this mineral which were subsequently submitted to various tests. While the metal contained in them was entirely different from any substance found on earth, the transformation caused by heat in varying degrees of intensity might be compared to the changes in the color of a piece of iron when it is subjected to high temperatures. The only essential difference was that the minerals found on the moon went through these color changes at lower temperatures—ranging from 50 degrees to 218 degrees Fahrenheit.

In order to make certain that no plants or other forms of life existed in any part of the moon, Professor Banning explored and thoroughly investigated all of the places where changes that might have been caused by vegetation had previously been observed by astronomers. Among the regions which we visited during this visit for this purpose were the interior of the ring mountains Plato, Aristarchus, Grimaldi, and Alphonsus. We also flew back and forth over the Sea of Serenity, approaching close enough to the surface to observe all important details, but we did not find any evidence that either animal or vegetable life had recently existed there.

For some mysterious reason, Professor Banning seemed very much pleased when he had convinced himself indubitably that no plants or animals of any description were living on the moon.

"It's much better to begin with nothing at all than to run the risk of having to fight undesirable things," he murmured, half to himself. Just what he meant by this cryptic remark I did not know until several years later.

As time is reckoned on earth, we spent approximately ten days in exploring the half of the moon which is visible from the earth. All during this time I had been impatient to see what was on the far side of the lunar sphere. Professor Banning had grudgingly consented to our making one brief trip for a short distance beyond the western boundaries of the earthward hemisphere, while that portion of the moon was illuminated by the sun. Naturally, it was not feasible to penetrate beyond the lighted parts of the opposite side, since there we had no friendly earthshine to light our way as was the case on the portions which faced the earth.

I can only report that we discovered nothing startling or unusual. The landscape on the far side of the moon was very similar to that which is visible from the earth. The characteristic features, such as magnificent mountains, spacious craters, abysmal clefts, and glittering rays were all duplicated on the other side of the moon.

We took a large number of photographs from the air. When pieced together, these pictures constituted an aerial map of about one-fourth of the hemisphere which is turned away from the earth. Because of the fact that a considerable part of this half of the moon was in darkness, we were not able to map it completely.

The number of actual landings we made on the far side of the moon were limited—only five to be exact. The last of these stops came very near being the termination of our adventure.

Berglin had set the *Amundsen* down on a level stretch of desolate ground about 300 miles from the imaginary line, which marked the eastern boundaries of the moon's disc as seen from the earth.

We were all weary and had planned to rest for several hours. From the place which we had chosen as our camping ground we could see the sun low in the horizon, so that neither the light nor the heat was excessively intense.

In examining our surroundings before retiring, I noticed that we were close to a peculiar formation. Our flyer was just inside the angle formed by two cracks in the ground, which met at an angle of approximately 120 degrees. I estimated this from the fact that the amount of divergence seemed to be just about the same as the angle of a regular hexagon. The most remarkable thing about these cracks were that they extended as far as the eye could reach in perfectly straight lines. When I first observed them, they were only a few inches wide. Interested as I was in this unusual feature, it did not

occur to me to regard it with foreboding, or even to point it out to my companions. At that particular moment I was more interested in getting some sleep than in studying geology—or perhaps I should say "selenology."

How long I slept I do not know, but when I did awake it was with a weird feeling in my bones that something was wrong. I glanced out of the window and what I saw made me utter a yell that jolted Berglin and Banning from their slumbers with rude suddenness. Stretching away from us in almost rectilinear regularity were two ridges about three feet high. They seemed to be made of thin clay or mud which oozed forth from the bowels of the moon and piled up higher and higher as we watched.

One of the ridges extended directly under our flyer. So rapidly was it increasing in size that it had almost engulfed us before we realized what was happening.

"Quick!" cried the Professor. "Turn on the rear rocket tubes. Give it all you have—full speed ahead."

Berglin responded instantly, but the glutinous material, half fluid, half solid, already had grasped us in its tenacious embrace. Fortunately, the tail of the *Amundsen* was clear, so that we could at least make a valiant attempt to escape.

For several anxious seconds our fate hung in the balance. Starting with as much power as he dared to use, Berglin quickly accelerated until the maximum force of our powerful fuel was shooting through the rocket tubes. Under the terrific strain, the *Amundsen* shivered and groaned but held together.

Then we moved forward!

At first the movement was almost imperceptible, but nevertheless it was a motion and that was enough encouragement for us to keep trying. Inch by inch, foot by foot, we fought our way forward until, at the end of about half an hour, we cleared the ground and hopped triumphantly into space.

"Soar around for a while. I want to study this," the Professor commanded. It was then our privilege to observe a phenomenon such as mortal eyes had never before beheld—namely the birth of a crater, or ring mountain.

From our vantage point on high we were able to see that the ridge, which had threatened to engulf us, was but a part of a gigantic formation. It then became evident to me that the cracks I had seen a few hours previous had been part of an enormous hexagon. Through these fissures, semi-fluid material from below the surface had oozed out, while at the same time the section of the surface which was thus detached had sunk in.

It wasn't long before the flowing clay or mud had filled in the corners so that the wall changed from a hexagonal to a circular form.

"Well," said the Professor after a while. "That settles another important question that has puzzled selenographers for some time."

"What question is that, Professor?" I asked.

"The question as to how these so-called 'craters' were formed. You can easily see now that they are not craters at all, because volcanic action has nothing to do with it."

To which I replied, "Whatever it is that forms those rings, I'd just as soon steer clear of them from now on—especially the baby ones that are just getting 'borned'."

CHAPTER XIV

Preparing for the Homeward Journey

In planning our itinerary, Professor Banning had set the date for our departure from the moon exactly two weeks after our arrival there. The main reason for this was that at the expiration of fourteen days the moon had moved around to the opposite side of the earth so that it was leading its mother planet in the joint march around the sun. This enabled us to make use of the momentum of the earth on our return journey, just as we had utilized the momentum of the moon on the first part of our trip.

The fourteen days referred to were, of course, *terrestrial* days which really amounted to only one of the moon's days as recorded from sunrise to sunset.

Our supplies of oxygen, water, food, fuel and other necessities had been calculated to suffice for an absence of two weeks—with liberal safety factors provided, of course.

During this period we succeeded in accomplishing, with surprising thoroughness, all the things which the Professor had mapped out for us. These tasks were two-fold in character: First, to answer the most important questions regarding the moon which had previously puzzled and baffled astronomers, and second, to learn as much as possible about the chemical and physical composition of the moon's surface.

So important is it for mankind to know the correct answers to the questions which for generations have been asked about the moon, that I think it will be pertinent to summarize them here. For convenience and clarity I am using the "catechism" or question and answer format:

Q. Has the moon any atmosphere?
A. No. Scientists have known this for some time, although there have been a few who thought they could detect evidence of the existence of a very tenuous atmosphere on the moon. Our investigations showed that the moon has no atmosphere comparable to that of the earth.
Q. Is there any water on the moon?
A. Only a very small quantity, which is in the form of vapor during the lunar day and is converted into hoar frost at night.
Q. Is there any vegetable life on the moon?
A. Since vegetable life as we know it requires both air and moisture, it is evident that no plants such as we know on earth can exist on the moon. We found not even the slightest vestige of plant life.
Q. Is there any animal life on the moon?
A. No, for the same reasons that vegetable life could not exist there.
Q. Is there *any* form of life on the moon?
A. No.
Q. How then, can the changes in coloring which take place as the temperature changes be accounted for?
A. We found this to be due to the physical effects of heat on certain mineral substances, corresponding to the color changes in a piece of iron when it is heated.
Q. Are the so-called "craters" on the moon volcanic in character?
A. No.
Q. How were these ring mountains formed?
A. By clay and similar semi-fluid material oozing up

to the surface through cracks formed when the moon cooled.

Q. How were the rays on the moon formed?

A. When the moon cooled from a molten state, crevasses were formed in the surface, similar to the cracks which would be produced if a hot sphere of glass were thrust into cold water. Later, these cracks became filled with a metallic substance, which reflects the light of the sun and makes them stand out brilliantly from the rest of the moon's surface.

Q. How were the deep valleys or gorges on the moon formed?

A. They must have been formed either by comets or meteors striking the moon glancing blows.

Q. Does the hemisphere of the moon which is not visible from the earth differ materially from the part which is visible?

A. The topographical features are quite similar on both sides of the moon.

I realize that there is nothing especially remarkable about the foregoing information. Most of it has been suspected by the keenest students of selenography for some time. But since this is not intended to be a bit of sensational fiction, but merely a faithful account of our explorations, I must chronicle the facts as they actually existed.

In order to find out as much as possible regarding the composition of the moon's surface, Professor Banning directed me to collect samples of soil and minerals from each of the various characteristic portions of luna's surface. Occasionally he helped me in this work, but most of the time I did the gathering alone, while Banning busied himself at a small bench which he had fitted up as a chemical laboratory at the rear of the *Amundsen's* cabin. Here he fussed eternally with his beakers, test tubes and crucibles. For hours on end he would work in silence, then would surprise us with an unexpected whoop of triumph or a groan of disappointment. However, he did not vouchsafe to give us any explanation of his chemical researches and neither Berglin nor myself would admit being curious enough to ask him regarding his discoveries.

On the day before the one scheduled for our departure for home, however, Professor Banning issued a singular order which could only have been predicated on something which his chemical investigation had revealed. He directed Berglin to set the flyer down close to the spot where we had previously blasted out a portion of the giant ray about a hundred miles west of ring mountain Rhetius. Again we shot off a charge of radatomite, but this time we took the precaution of piling a large number of heavy boulders over the place to be blasted, thus preventing the fragments from being thrown far from the center of the explosion.

Following the professor's instructions, I filled all the available storage space in the *Amundsen* with chunks of the material torn from the great ray.

CHAPTER XV

An Alarming Discovery

CAME the zero hour for our departure.

Momentous as this occasion was, we hopped off as nonchalantly as if we were only going on a short trip of exploration.

On our return voyage we had planned to use the same strategy which had proved successful on our trip from the earth to the moon.

Steadily and swiftly we climbed until the ground beneath us lost its concave appearance and assumed the form of a huge ball hanging in space. We directed our flight so as to carry our flyer along the same path the moon was traveling in its journey around the sun.

By operating the four dimensional steering apparatus, we severed the gravitational tie which bound us to the moon, and then made the hairpin turn which sent us hurtling back toward the approaching earth.

A few moments after this maneuver was completed, I noticed off to one side of us a peculiarly shaped object drifting in space. To see anything at all in what should have been an absolutely empty void gave me such a shock that I uttered a blood-curdling yell which made my two companions jump.

"Look!" I cried. "See that object out there! It must be a meteorite or something!"

"Hardly a meteorite," Professor Banning corrected me. "It looks to me like something from our flyer. Out there, with nothing to compare it with, it's hard to tell whether it is a large body far away or a small object close to us. Let's see how it looks with the glass."

Banning picked up a field glass and trained it on the mysterious object. "I thought so!" he cried. "It's a part of something from our ship! And if I'm not mistaken, it's a piece of a four-dimensional rocket tube!"

"Let me look!" He handed me the glass and I pointed it at the mysterious object.

"You're right!" I exclaimed. "It *is* a section of our four dimensional rocket tube. It must have been broken off the tube for steering us back out of hyperspace. How do you suppose that happened?"

"It probably became cracked or weakened while we were tearing ourselves loose after getting caught in the ooze from that newly formed ring mountain," the Professor suggested. "When you turned on the other four dimensional rocket tube a moment ago it gave the ship a jolt which must have loosened the weakened part."

"Is the loss of that part likely to cause any serious consequence?" Berglin inquired.

"Serious!" I said. "I'll say it's serious. Without that tube functioning properly it's going to be impossible for us to get back into three dimensional space. It means that we are doomed to drift around in hyperspace until our oxygen, our water, and our food give out."

Berglin seemed unwilling to accept my statement. Turning to Banning, he said, "Is that true, Professor?"

"Yes," was Banning's simple response. "It's true that we'll have to stay in hyperspace until we can get that four dimensional rocket tube repaired."

"Get it repaired?" I said in a tone which I fear was not very respectful. "You talk as if all we have to do is phone for a plumber—preferably one with a mathematical training—to fly out here and put a new four dimensional tube on our space ship."

Fortunately my sarcastic and discourteous comment did not seem to offend the Professor. He merely gave me a tolerant smile and said, "The trouble with you, my boy, is that you give up too easily. We hear a lot about the persistency of youth but after all it seems to take a man of mature years and experience to realize the fact that, no matter how hopeless a situation my be, it pays to keep on trying to get out of it."

"Do you mean that you think we still have a chance?" I said.

"Certainly. A most excellent chance. That is, providing you have enough courage and confidence in me to do what I tell you to do," said the Professor.

"After some of the things that have happened I don't feel like bragging about my courage, but as far as confidence in you is concerned, I don't think I need to tell you that I shall always be for you as I always have been. If it's just a case of taking a chance, I'd much rather be making a try at escaping rather than sitting still waiting to die."

"That's the way to talk."

"All right. What do you want me to do?" I asked.

"The first thing to do is get into your space suit."

"Would you mind telling me just what you expect of me?" I asked.

"Of course I don't mind telling you. I want you to go outside and repair that rocket tube," was his calm reply.

"But how am I going to do that? We haven't any spare tube and we haven't the material or the tools to make a new one. As for the possibility of fastening the broken parts together, I don't see how that can be done either. In the first place we can't get hold of the broken part and in the second place it wouldn't do us any good anyway, because we haven't any welding apparatus or any other way to fasten the broken parts together."

"But how about the other four dimensional rocket tube?"

"You mean the one we employed to shoot us into hyperspace with?"

"Yes. We don't need that any more, do we?"

"I suppose not. All that can do is get us further into hyperspace. What we need is something to get us away from hyperspace."

"Exactly. Except that they pointed in opposite directions, the two four-dimensional rocket tubes were identical in shape and structure, were they not?"

"Of course."

"Then all we have to do is remove the good rocket tube and bolt it on the place where the broken tube was; then we'll be able to navigate back into three dimensional space."

"The way you describe it, the job is as simple as changing a tire on an automobile," I remarked as I began getting into the space suit.

"You may find it even easier than that," was the Professor's reply.

"Oh well, I suppose somebody has to do it. So here goes."

"You won't require all those tools," said Banning, pointing to the trowel and pickaxe which hung at my belt. "You may need the hammer, though, and of course the monkey wrench will be the most useful of all. Let me suggest, though, that you fill those empty pockets with chunks of this material that we blasted from the great ray on the moon."

"What's the idea? Am I supposed to play a cosmic game of duck on the rock, or something like that?"

"Never mind the wisecracks. The lumps of rock will make you heavier and they may come in handy for another purpose." With that he opened the door of the airlock and started to screw on my helmet.

"Just a minute!" I shouted. "You're not trying to get rid of me, are you?"

"Of course not. We may need you to do some more stunts before we get back home. Why did you ask such a question?" he asked.

"How fast are we going now?"

"About 66,000 miles per hour."

"Whew! How do you expect me to hang on to the ship when it's going at such a speed? I'll be blown to smithereens the minute I stick my nose outside!" I cried.

"Nothing of the sort. Don't you realize that your body is moving with the same velocity as the flyer and in the same direction? Relatively speaking, the *Amundsen* will be standing still so far as you are concerned. You must remember that out here there is no air or other gas to offer any resistance or to form a draft."

"But suppose I should slip and fall off the flyer?"

"There's no danger of that, either. You can't fall away from the flyer unless something pushes you or pulls you. We are in hyperspace now and neither the moon, the earth, nor any other body is exerting any appreciable attraction for the flyer or for your body. On the other hand, there is a small but none the less potent gravitational attraction between your body and the space ship, so the only way you are likely to fall is toward the *Amundsen*."

Satisfied at last, I entered the airlock, sealed the inner door and turned on the valve to remove the air from the small chamber. But despite Banning's optimistic assurances, there was a feeling of trepidation in my heart when I opened the outer door.

In my earphones I heard Banning's voice say, "Can you hear me?"

"Sure!" I radioed back to him. "Your program is coming in fine. Suppose you put on the record and play 'Happy Days Are Here Again'."

"Perhaps it will be more appropriate if I play 'Get Out and Get Under the Moon!'" was his come-back.

"Well, here goes nothing!" I shouted as I eased my inflated form through the narrow opening.

Much as I depended on the correctness of Professor Banning's statements, I was astonished to discover that the flyer did seem to be floating motionless in space. With my mechanical hand I kept a tight grip on the handle of the door. There seemed to be no strain on my arm. By way of experiment I released my hold, but kept on the alert so I could make a quick grab for the handle in case I needed to. Instead of dropping or being blown away, my body swayed gently toward the flyer.

With the instinctive idea of getting on the part of the ship which we called the top, I started to pull myself up the side of the flyer. I found to my surprise that it was just as easy to stay on the bottom as on any other part of the craft. I tried crawling completely around the ship and had the peculiar sensation that I was on top all the time, while the *Amundsen* seemed to spin beneath me, as a barrel turns when a circus performer balances himself on it.

CHAPTER XVI

Man Overboard!

I WORKED my way around to the broken rocket. It took me but a few minutes to unscrew the six nuts which held the stump in place. Placing the nuts in a pocket which I had kept empty for that purpose I removed the damaged tube and let go of it. I

expected it to drop out of sight, but instead it clung to the side of the flyer.

In a similar manner I removed the good four dimensional tube, but took good care not to let go of it. The only difficulty I encountered in fastening the tube in place at the other opening was that the broken fragment which I had just removed kept bumping against my helmet.

Working as I was under a severe nervous strain, it was exasperating to have this lump of metal banging against me, but I didn't do anything about it until I had screwed the last nut home. Then I grabbed the offending object in my mechanical fist and heaved it away from me with all my might.

To say that what happened next surprised me would be putting it mildly. Before I realized it, I found myself shooting away from the *Amundsen* at an alarming rate of speed. By the time I recovered myself enough to yell for help, I was probably at least a mile away from the space flyer, with the gap between us widening constantly.

If you can imagine how it would feel to fall off an ocean liner in mid-ocean, you will have a faint idea of how I felt as I drifted out there in that awful void and watched the space ship grow smaller and smaller in the distance.

The worst of it was that neither Banning nor Berglin seemed to have noticed my departure, since I had been working near the tail of the flyer where they could not see me through the windows.

Finally, I gained command of my vocal chords and yelled, "Help! Help! Man overboard!"

Instantly, the welcome voice of the Professor came to me through the earphones: "How in the world did you get way out there?"

"Search me. It happened right after I threw away the broken rocket tube."

"You threw it way? That accounts for it. The reaction from the force of the tube as it left your hand pushed you in the opposite direction."

"I suppose you are going to tell me that I'm suffering from the effects of one of Newton's laws of motion. But right now I'm more interested in getting back to the ship. Can't you swing around here and pick me up before I get any further away?"

"That would be a dangerous thing to attempt, I'm afraid. If we should turn on any of the rocket tubes at the speed we are traveling, it is likely to alter our momentum so much that you'd never be able to hang on, even if we could come close enough for you to reach us."

"Do you mean to tell me that there is no hope for me—that I'm doomed to hang out here forever?"

"Of course there's hope for you. If you'll just keep your head and do as I say, you'll be back here in a few minutes. It would be risky for us to try to come to you, but that doesn't prevent you from coming back to us."

"What do you want me to do, swim back? When it comes to swimming in this stuff, I'm afraid my training has been sadly neglected. I'll do my best, though," and I started kicking with my legs and waving my arms.

"That won't do you any good," the Professor told me. "Better save your strength. The best way to get back here is to use the same principle that sent you out there."

"What do you mean?"

"The force of reaction. Your pockets are full of rocks. Suppose you get one of them in your mechanical hand, then take careful sight toward the flyer and throw the missile in exactly the opposite direction. This will make you move toward us."

I followed his instructions and sure enough I began to move slowly in the general direction of the *Amundsen*. To accelerate my speed, I hurled two more rocks. My aim was fair but far from perfect. I was still at least a hundred feet away from the ship as I swept past it and beyond it.

This got me excited and I started heaving my missiles with all my might in rapid succession. In this manner I succeeded in projecting myself directly at the space ship, but when I reached it, my speed was so great that I had no time to grab hold of anything. Like a huge rubber ball, my inflated space suit bumped into the side of the flyer and bounced briskly away again.

"Keep your head!" the Professor warned me. "Take time to aim carefully and try to judge your speed more accurately."

"What do you think this is," I retorted, "a cosmic golf game? If I slice my shots I get in the rough, and if I hit 'em too hard I bounce off the green. I'm afraid I'll never make par on this hole, but here goes for another try."

Perhaps I shouldn't have made this feeble attempt to be funny if I had realized that my ammunition was running short. I was still several feet away from the *Amundsen* when I discovered to my horror that my last chunk of lunar rock was gone. I was about to give up in despair when I happened to think of the six extra nuts which I had taken from the broken rocket tube.

"Thank Heaven I saved them," I said to myself.

After that there was no more fooling—no more prodigal waste of my precious missiles. With all the care of an expert playing in a championship match, I tossed the first of the nuts. It brought me closer, but a trifle to one side of my target. This I corrected by carefully throwing the second nut. I still had one of the metal objects left when I finally nudged gently against the side of the space ship and caught hold of a strut. Naturally I lost no time in getting inside the airlock and closing the door behind me.

CHAPTER XVII

Back to Earth

THE remainder of our journey was uneventful. When the proper moment arrived, Professor Banning instructed me to direct a blast through the four dimensional rocket tube. It worked perfectly, bringing us back into the influence of the earth's gravitational attraction.

In returning, we duplicated the same maneuver we had used in landing on the moon; that is we made a hairpin turn around the earth, so that we were traveling in the same direction and at about the same speed as our planet was moving in its orbit. Then, with the aid of our rocket motors, we sped through the upper regions of the earth's atmosphere until we could make out the topographical features of the land beneath us.

Under the skillful guidance of Berglin, we navigated our craft until we were hovering over our home field at San Diego. Here a most alarming sight met our gaze. As far as the eye could perceive, the roads in all

directions were jammed solid with automobiles, motorcycles, and other conveyances. Out in San Diego Harbor there was an inconceivable jumble of boats of all kinds and sizes, from canoes to battleships. So close were they packed that a person could have walked from San Diego to Coronado, on the opposite shore, merely by climbing from one boat to another.

The air was so thick with airplanes that we had difficulty in keeping out of their way. Worst of all, the field on which we were expected to land was packed full with a surging, milling mass of humanity.

It looked as if all California with additional representatives from Arizona and Old Mexico, had gathered in that one spot to greet us. To attempt a landing under such circumstances was out of the question.

"Let's go to Clover Field," Berglin suggested, and Banning agreed.

The enormous swarm of airplanes attempted to follow us, but so swiftly did our rocket motors carry us that we soon left them far behind. We found the field at Santa Monica absolutely deserted. Not an airplane, not a human being was in evidence. Apparently they had all gone to meet us at San Diego.

"In a way this is very fortunate for us," Professor Banning said. "It will give us a chance to unload our cargo without having a lot of curious reporters snooping around. There are very strong reasons why I don't want anybody to know what we brought back with us from the moon."

"Would you mind letting Berglin and me know what this stuff is?" I asked. "You know of course that you can depend on us to keep it under our hats."

"Why of course you are entitled to know. It is platinum—pure, unadulterated platinum."

"And how much is it worth?"

"About one hundred and ten dollars per ounce."

"One hundred and ten dollars per what?"

"One hundred and ten dollars per ounce. But the monetary worth of platinum is not so important as its value in science and industry. As you probably know, there are a number of cases where platinum has to be used in spite of its high cost. In some chemical operations, for instance, platinum receptacles must be used. Another illustration is in dentistry. One reason why porcelain jacketed crowns are so expensive is that they are made over a platinum shell. In many ways a dependable supply of cheap platinum would be of great advantage to humanity."

"Well, now that we have all this platinum here, what are we going to do with it?" I asked.

"That looks like an ideal hiding place," the Professor replied as he pointed to a ramshackle building just across the road from the airport. It had formerly been used as a real estate office. With the selling out of the subdivision, the building had apparently been abandoned by had been left standing. Its ruinous appearance made it only the safer for our purpose.

"We'd better hurry," Banning admonished us. "It won't be long before that flock of airplanes will arrive from San Diego."

Between the three of us, we carried the chunks of metal to the building, piling the material in such a way that it could not be seen through the windows.

"Some dark night, we'll come out here with a truck and remove the platinum," Banning observed, as he closed the door of the building.

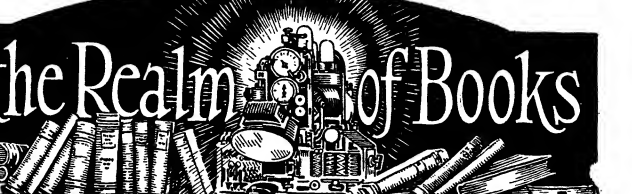
Just then something struck my funny bone and I started to laugh.

"What's the matter with our facetious friend now?" the Professor inquired.

"I just had a mental picture of myself out there in space, heaving away lumps of platinum worth a thousand dollars apiece, as if they were mere pebbles."

"Don't worry about that," said Professor Banning. "There's plenty more where that platinum came from—thousands of tons of it!"

THE END.



A Book of Poems

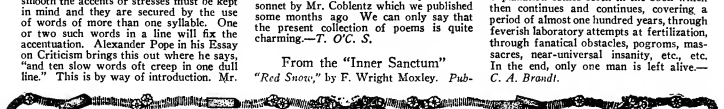
"Shadows on a Wall," by Stanton A. Coblentz. *Published by Poetic Publications, New York, N. Y. $1.00.*

THIS is the first time a book of poems has been reviewed in our columns, but Mr. Coblentz, whom we consider one of our best authors, has a distinct claim upon us. The book is a collection of poems which have appeared in many periodicals. The writer of this review has always been interested in prosody, and prosody in the English language is nearly always dependent on accent, and to make a line run smooth the accents or stresses must be kept in mind and they are secured by the use of words of more than one syllable. One or two such words in a line will fix the accentuation. Alexander Pope in his Essay on Criticism brings this out where he says, "and ten slow words oft creep in one dull line." This is by way of introduction. Mr. Coblentz in his very interesting selection of verse not only has adhered to this proper accentuation and the balance of such lines as criticized by Pope, but has done two other things. He has infused his lines with true poetic spirit and he has avoided the modernism of verse which so many indulge in. It is a relief to find a book free from vers-libres. Many of the poems are sonnets and sometimes a succession of sonnets are used as stanzas. The sentiments which appear throughout the book certainly win the writer's approval and a true poetic spirit is everywhere in evidence. Our readers will recollect a very beautiful sonnet by Mr. Coblentz which we published some months ago. We can only say that the present collection of poems is quite charming.—*T. O'C. S.*

From the "Inner Sanctum"

"Red Snow," by F. Wright Moxley. *Published by Simon & Schuster, Inc., New York. $1.00.*

THERE exists in my mind a suspicion that the doors of said "inner sanctum" were not so very well guarded, when the manuscript of this book got around. The theme of the book is interesting enough: The cessation of births follows the precipitation of a carmine snow-flaky ashy substance *via* purple clouds. This idea is quite interesting to anyone interested in scientific fiction. An intricate impressive formula would have done the trick. But no scientific explanation comes forth in the book which then continues and continues, covering a period of almost one hundred years, through feverish laboratory attempts at fertilization, through fanatical obstacles, pogroms, massacres, near-universal insanity, etc., etc. In the end, only one man is left alive.—*C. A. Brandt.*



In this department we shall discuss, every month, topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

THE SCIENCE CORRESPONDENCE CLUB

Editor, AMAZING STORIES:

Many weeks have passed and again the Science Correspondence Club, through the kind and understanding assistance of AMAZING STORIES, has important news for the readers who may be interested.

With the new year at hand an entirely new policy will go into effect, concerning the S.C.C. First and foremost is the change of name. It is proposed that the Society be renamed "International Scientific Society." The archaic and tedious correspondence, so necessary in the past, has been done away with almost entirely, by our publication and form-letter methods of communication. New arrangements on branch-handling have been inaugurated, also. An affiliation has been consummated with the German Interplanetary Society known as the "Verein fuer Raumschiffahrt." Willy Ley, President. The affiliation brings to us the most important up-to-the-minute developments in German Aviation and rocket propulsion science.

Our library is in full operation and is more than an ordinary library, it is a scientific information bureau also. Everything in the way of information from the price of a six-inch reflector to the number of star-clusters in Castor and Pollux, may be obtained there. A constant stream of books, clippings and magazines is flowing into the library from generous members.

The publication, named "Cosmology" has grown to the dignity of carrying advertisements and is illustrated by the artistic members of the S.C.C. The more well-known contributors are—Dr. Morehouse, Pres. Drake University, Iowa, Lilith Lorraine, R. F. Starzl, Willy Ley, William Tyler Olcott, David B. Pickering and Robert A. Waltz. Our honorary list is now very impressive; replete with names that are household words in Science and Scientifiction. At the head of this list stands our most revered Honorary Member, Dr. T. O'Conor Sloane, to whom the Science Correspondence Club owes much of its success.

The Society wants earnest, young and old laymen of the world, who are charged with the germ of science, as members, and those who already have made their mark in science also. The S.C.C. contains both men and women, instructors and pupils, the irresistible flame of youth, the glowing and steady coals of age, and the priceless jewel of International companionability and goodfellowship. The aim of our Society is to promote science in all lands and climes by personal and literary contact. Help us make the S.C.C. a society for and by science. Information may be obtained by addressing the business office: 3834 Michigan Ave., Chicago.

Expressing best wishes to AMAZING STORIES and its vast "family" of readers, we stand at your service on behalf of science.

Walter L. Dennis,
Treasurer, S.C.C.

(A number of months have passed since the Science Correspondence Club was established. AMAZING STORIES has received various letters from correspondents expressing the desire to correspond with some kindred spirit. We naturally were deeply interested in the idea but hardly dared to hope that it would ever be so well carried out as it has been. We have received very presentable copies of this magazine and we feel that it is not necessary to say it has a future—what we may say is that it is now in full fruition. We cannot help feeling that while it is on its own independent footing, it is a child of AMAZING STORIES.—EDITOR.)

AN AUTHOR ON THE WAR PATH

Editor, Amazing Stories:

I am delighted to find that Dr. Smith has at length entered the fray. It promises to be most interesting.

Now, in demonstration of the statement, element 95 is discovered. This cannot be proven impossible by saying there are only 92 elements. There are only 92 *known*. But if an element, say number seven, is used, and its chloride used as a solvent for extracting some rare organic substance, after which it is distilled to obtain the dissolved substance ——. That's open to argument by anyone who has had the misfortune to make some nitrogen chloride. (N is number 7.) It is the most explosive substance known. Six times as touchy as nitroglycerine.

I will first answer your point on "Piracy Preferred." You say that the probabilities against it can be made higher than any assigned value. Certainly, go ahead. That doesn't bother my proposition any. I stated that the probabilities against it were practically infinite. But I also stated that he had discovered a means of controlling that probability, of making it suit his purpose. If you believe this too hard to swallow, think of a permanent magnet. There an invisible force has made each of those molecule groups turn, and face the direction desired. Has it not? What are the probabilities against having each of them face the same way?

The dud star I still claim could not exist in space. That the results which would prove this are based on Einstein's theories, which you so neatly avoid, I admit. However, I do believe that we can use these in connection with a point not concerned in the problem of getting places and doing things. That you had to overthrow the theory to go outside of the solar system, I acknowledge. However, it was not necessary to have this error, for you could have brought DuQuesne to grief in other ways.

The gravitational field would be so intense that this star would be absolutely unable to emit light. Light would be too heavy to leave. Further, this star could curve space, as does any other mass, in ratio to its mass. So great was its mass, and so concentrated, that space near it would be distorted more and more, till finally it would close in about it, as space has curved in about the widely spaced matter of our universe, closing it in. But in this case, the radius of curvature would be very small. The result would be that there would be no possible means of detecting this dud star. Neither light, heat nor gravitational effect would escape from the blanket of space thrown about it.

That it is extrapolation from known data I freely admit, and your comment seems to suggest that you will not accept extrapolations. In that case, our knowledge of the solar system is confined to Earth. We extrapolate from data gained by two small lead balls in the laboratory, thus determining the gravitational proportionality factor, and so determine the actual mass of the earth. Next, we extrapolate further, and determine the mass of the sun, assuming that the force that holds the Earth in its orbit is exactly similar to the force that makes my watch stop running every time I make the mistake of dropping it. How do we know? Might it not be that in such a great mass the force exists in some other way than in direct proportion?

No, if our knowledge of the solar system is usably correct, the dud star did not exist in this space.

In the solar system of sun and satellites, there is a single body where rests by far the greater portion of mass, making a reasonably symmetrical gravitational field. Further, the distances of the satellites from the parent body is not of the same order of magnitude as the distance from sun to planet. The planets can, then, hold their children firmly, while both are actually describing orbits about the disturbing center of attraction.

On the other hand, in the Osnomian system, the suns were said to be of the same order of magnitude, and the distances separating them were of the same general magnitude as the distances of planet to sun, for all were readily visible at all times.

The conditions of the solar system would be lacking. The Moon could not have a satellite at any distance commensurable with its distance from Earth.

I cannot offer you mathematically derived proof, and so I fear I must drop that point, however—I don't wish to live on so unstable a home!

The ammonia cooling plant didn't really refrigerate. Here's one good reason: The critical temperature of ammonia gas (which was used) is 130 degrees Centigrade. On Earth water boils at 100 degrees Centigrade, but what about Osnome with twice the air pressure Earth has? I believe the figure is 127 or 8 for the boiling point. This allows three degrees leeway, and if you are going to eject your steam, thus using a little extra pressure——!

Further, the system works on the latent heat of vaporization of the gas, and even if you did succeed in operating below the fatal 130 mark, the latent heat of vaporization would be practically zero, and I sincerely doubt that you could liquefy any amount of it. Further, if it is cooling a wall that is white hot, the ammonia would immediately be volatilized, then decomposed to H_2 and N_2. Again, if they had this tremendous amount of heat energy concentrated on the ship, the ship would have had to be half full of water tanks to carry the necessary water to last even so long as the battle did.

I agree with you on the red paint. I see your point in using the less efficient method.

I believe that the latest theories of matter and of rays say that there decidedly is no ether, but that rays are just little knots of energy traveling with a definite mass and energy through curved space, making little knots in that space where they are. Thus no ether, and no sub-ether is in evidence.

Yet Schrödinger says that the electron is the manifestation of a group of waves in a mysterious sub-ether. This doesn't sound so different from that system of yours. But perhaps they, like Judy O'Grady and the Colonel's lady, are under the skin relations.

Now one last point. Though you used your author's right to declare Einstein's theory wrong, your first declaration thereof on DeQuesne's part was not proof. Let us suppose that Einstein's principles are holding. The ship starts, rapidly accelerates, reaching a terrific speed, but less than that of light, but still goes on accelerating. To the people in the car, the acceleration will be uniform, and the velocity will mount steadily with an infinite limit! They could not detect that they were going slower than light, for, while their speed increased, the mass increased, and hence, a given force, acting on a greater mass, produced a lesser acceleration. But simultaneously with the increase in mass, came a decrease in time rates. That is, time passed more slowly because of their high velocity. The greater their velocity, the slower time passed. Yet their velocity was a fact they could measure by outside, unaffected bodies, and, while a second might have become a year in length actually, it would still be a second, to the best of their knowledge, and they would be unable to prove otherwise. The result is, that with a velocity very near that of light, they travel for a year, and call it a second. "What ho," remarks the pilot, checking his position, "we are traveling a light-year a second. We have exceeded the velocity of light. Einstein was all wrong. How do I know? because I am going faster than light, and can check it by outside objects which fall a light year further back, each second."

So DuQuesne would have a bit of trouble telling how fast he was going, as would Seaton.

But worst of all, I would very much like to know how they could get the spectrum of a star ahead of them when exceeding the velocity of light, how they could observe the heavens? The Doppler effect would put the reds clear out in the X-ray region. Indeed, they would be in serious danger of being very severely burned if they came near a sun going that fast. And certainly they would have been unable to see anything behind them.

John W. Campbell, Jr.,
46 Bigelow St.,
Cambridge, Mass.

(We have taken the liberty of abbreviating Mr. Campbell's letter anent Dr. Smith's communication. It is very interesting and takes care of itself without editorial comment. But it is our guess that far from concluding the discussion, Mr. Campbell's letter will surely start the works all the more..—Editor.)

THE ACCELERATION REQUIRED IN INTERPLANETARY TRAVEL

Editor, Amazing Stories:

I have been following with interest all references to acceleration both in your editorials and Discussions.

I have been particularly interested in acceleration with reference to "space ships."

Many ingenious ideas such as making an interplanetary trip in a bath tub, have been pre-

scented, all having to do with the disastrous effect of too high an acceleration. Although having merely a superficial knowledge of the laws of motion and gravitational attraction, I fail to see why a very high acceleration would be required in interplanetary travel. I have worked out the problem of traveling from earth to Mars and 32 feet per second is the greatest acceleration used.

We cannot start with a high acceleration because of the heat which friction in the atmosphere would insure at a high velocity.

We shall start with an acceleration of 10 feet per second per second and continue thus for the first four thousand miles.

We shall let T stand for time, s for distance, a for acceleration, v for velocity and y for a distance of 32 feet per second per second on the a of gravity.

First we must take the formula $S = \frac{1}{2} g T^2$ or $S = \frac{1}{2} A T^2$; from this: $T = \frac{V 2 S}{a}$

Now the distance is 4000 miles so T equals 8000/10 but all distances must be in feet so we change 8000 miles to feet in the next formula; T=42,240,000 T=4,224,000=2055 seconds or 34.25 minutes.

Since we now have our distance of 4000 miles and our time of 34.25 minutes, we wish to know our velocity at end of 4000 miles. Then V=a t (time in seconds, distance in feet) V equals 2055 x 10=20,550 feet per second=4 miles per second or 14,400 M.P.H. We are now 4,000 miles from the surface of the earth and have suffered no physical discomfort due to acceleration. The atmosphere is left far behind and the gravity or pull of the earth is merely 1/5 of what it is at the surface. This is found by the law of gravity, inversely proportional to the square of the distance between their centers of mass in this case. Let 1 equal pull at earth's surface, then since 8000 miles is the distance between their centers of mass; $1/\frac{8000^2}{4000^2}$=64/16 or ¼, where x is the pull at a distance of 4000 miles. Since the acceleration due to the earth at this distance is only 8 feet per second per second, we may increase the acceleration of our space ship to 32 feet per second per second without undue discomfort. For convenience we shall require a velocity, V, of 1,000,000 F.H. or 1,466,132 feet per second. Now V=a t=32 x t where t is in seconds. t=45,192 seconds or 12 hours 55 minutes. We wish to know the distance we have traversed in attaining this velocity, $S = \frac{1}{2} a t^2$ S=32 x 45, 192 (45,000 for convenience) giving $\frac{x}{2}$ as the value of x approximately 34,000,000,000 feet or 6,500,000 miles. Since we now have attained a speed of 1,000,000 miles per hour and are more than 6,500,000 miles on our way we may shut off our rocket tubes and "coast" through space! We shall place Mars at its mean distance of 63,000,000 miles. We have traversed 6½ million miles in approximately 13 hours 29 minutes.

Since we shall have to approach Mars with negative acceleration we must begin to decelerate when we are 6½ million miles away from the red planet. Of course since Mars' gravity is merely 1/5 that of the earth, we could approach nearer but for safety sake we shall not. Now then, 6½ million plus 6½ million equals 13,000,000 miles to be used in negative and positive acceleration. This leaves us 50,000,000 miles (63,000,000—13,000,000) to traverse at our uniform speed of 1,000,000 M.P.H. therefore 13 hours 29 minutes plus 13 hours 29 minutes plus 5 hours equals 76 hours 58 minutes or approximately 77 hours for the trip. Not bad, eh? I would like to see that sequel to "The Face in the Abyss." However, my vote goes to A. S. *every* time.

I can't see why some readers figure out such high accelerations.

Kenneth Weatherbie,
Wytopitlock, Me.

(We are putting in your letter as you have written it, leaving it to our readers to criticise and discuss, and we shall hope to get some response from them in time for publication in the next issue. One of the best ways to bring the violence of acceleration before the mind is to jump from an elevation. Even a jump from a chair if we alight with our legs straight and come down on our heels will give quite a severe jar. In bending the knees and lighting on the toes, we avoid the shock by prolonging the time of the negative acceleration.—EDITOR.)

IMPROVEMENT IN OUR MAGAZINE. ERRORS IN STORIES. KEPLER'S THIRD LAW.

Editor, AMAZING STORIES:

I have been reading AMAZING STORIES for the past three years so I feel as though I have a right to say a few things about it.

Since the change in your editorial staff the magazine has improved greatly. Before, one issue would be good and the next rotten. At the time of the change many issues carried but a single good story. Now I am delighted to say that the general standard has been raised and the issues are consistently good. I can't tell you how much I appreciate this since I like the type of stories that you print, but can't stand reading them unless the authors show imagination, some knowledge of science, give the heroes a little common-sense, and have at least the rudiments of how to write. The first and third are the most important. At present I find practically all of your authors to my liklng. I wish to add my voice to the request for the return of A. Merritt.

Now about errors in the stories. Personally, and I believe that many people will agree with me here, I do not mind errors in the science used, so long as the facts are plausible or needed for the sake of the plot. But I see no reason for violating any of the most elementary laws of science. In this connection I wish to point out a needless error, and one that adds nothing to the story, in the "Passing Star" in the September issue. The author says that the diameter of the earth's orbit was increased and the time of its travel around the sun decreased. Now Kepler's third law states that the cubes of the major axes of the orbits of the planets are proportional to the squares of the periods of revolution about the sun. This law can be deduced as a direct consequence of Newton's law of gravitation. Thus, if the diameter of the earth's orbit were increased, so would be the length of our year.

I think the illustrations in the magazine are good, but please see that they agree with the stories. Again referring to the September issue; the cover does not represent what your little explanation tells of it, the professor looking from his tower. The cover is obviously a view from an office through an ordinary window some distance from the ground, not through the small thick-glassed ports of the professor's low tower.

Of all the stories I have read in your magazine I believe I liked "The Skylark of Space" best; however, there are so many others that I hardly want to try to name them all. I especially remember "The Moon Strollers" and the story "When the Atoms Failed." And there was the one by Burroughs in one of the Quarterlies, "The Master Mind of Mars." "Skylark Three" appears to be even better than its predecessor.

John Tom Hurt,
2228 Barnard St.,
Waco, Texas.

(If our magazine is not good it is not from lack of thought on our side nor from lack of good authors. You probably do not realize how encouraging such a letter as yours is and how real an effort it requires for an editor to succeed in pleasing his clientèle. Every reader has his own views. We can only hope to strike an average. Possibly in the "Passing Star" there was some confusion between time of travel and rate of travel.—EDITOR.)

A LETTER TO AN AUTHOR FROM AN ADVOCATE OF MORE SKYLARKS

My dear Doctor Smith:

I have a great crow to pick with you about your sequel to "The Skylark of Space", namely—"Skylark Three."

Now this is not "hunk" or "soft soap" I'm handing you— this story kept me on my toes—figuratively speaking—until I turned over page 657 and looked on page 658, (October AMAZING STORIES) expecting to read at least that Richard Seaton, et. al., had returned to earth and made use there of the scientific wonders made known to them. Instead I was interrupted very rudely —awakened from my dream in which I was actually living with the Seatons and the Cranes—partaking of the wonders being handed to them —by your everlastingly "be blasted" termination of the story—namely the epilogue—which you must have put there intentionally to make it impossible to have a sequel to the sequel.

Doubtless you have read the Blue Book magazine—and more especially the series of stories entitled "Free Lances in Diplomacy."

Well, anyway, I have—and while I am no author—nor yet a critic—I think that your stories of Seaton and Crane, their wives and associates, could very readily be converted into such a series. Every month—for the past two or three years, at least, "Free Lances in Diplomacy" have held their own—a new adventure in each monthly issue —and your Skylark Stories would likewise make good in such a series. They have punch and live —have no "quantity production plot" such as, alas, most of the stories in A.S. now have—and are really "immense" at least were until you ruined them by cutting the last one off in such an abrupt and final manner as to make practically impossible any more of them—since Seaton, Crane, et. al. have passed into the beyond—according to the epilogue.

Dr. Smith—can't you resurrect them some way and let us have some more adventures by these extraordinarily interesting people—by a "Master Author"?

Thanks for your stories—and your attention to this letter.

W. J. Murro,
115 Washington Ave.,
Macon, Georgia.

(Here is a reader who, not satisfied with the Skylarks that Dr. Smith has kept fluttering around him, wants a whole flock to be hatched out for future consumption. Perhaps our correspondent recollects that after Conan Doyle had brought Sherlock Holmes to an ending, which of course we hope was a happy one, in other words he killed him off, he resurrected him in a sense, and told a lot more about the achievements of the great detective. So much appreciation has been expressed about the Skylark stories that perhaps the songs of the "blythe spirit," to use Shelley's expression, may yet reach our readers. Sherlock Holmes, as brought to life by Conan Doyle, gives a good example for Dr. Smith to follow. Perhaps he will give our readers a chance to quote "The Poet of the Skylark" mentioned above, and be able to say in future months as AMAZING STORIES appears, "Hail to thee blythe spirit! Bird thou never wert!")

A LETTER FROM BIRMINGHAM, ENGLAND, LOVE IN SCIENCE STORIES, THE QUICK DEGENERATION OF MAN

Editor, AMAZING STORIES:

I have just finished reading your August issue. It's jolly good. "Skylark Three" takes the cake. I have not read a science-fiction tale to compare with it. The science is fine and extraordinarily interesting. Dr. Smith has no mean literary ability either.

"The Last War" was absolutely great. Captain Meek gave no reason for the immunity of Nashky's ship from his force rays. Why must this tale end up with love? One of the reasons I read your magazine is because love is generally tabooed by most of your authors.

"The Mystery of Professor Brown" was jolly well written. It was a story in itself, though exceedingly short. Just a word about this month's cover. It's absolutely *IT* as regards drawings but "South Polar Beryllium Ltd." was a good tale, embodying many new ideas, such as the using of the Peristaltic Conveyor. The descriptions of the tractors were very good, while Morey's illustration was the goods.

Hamilton's "World Atavism" was very interesting. If it has taken hundreds of thousands of years for man to reach his present stage, why was only such a comparatively short time required for his degeneration after Dr. Grant switched on his ray? It shows "Skylark" cutting the Fenachrone ship in two. In the tale it breaks it into pieces, cutting a Urvanian rocket propelled ship in two. I mount the covers on cardboard, as I think they are worth it.

J. Mansel,
23 Hallewell Road,
Edgbaston, Birmingham, England.

P. S. Let's have another by John W. Campbell, Jr., soon.

(We are especially proud of getting such a letter as yours from the mother country. We, of the United States, often feel that we are objects of criticism to the people of Great Britain. We are glad that you appreciate Dr. Smith. It is not too much to say that in the "Skylark" stories he covered himself with glory. Everybody likes him. The story about the beryllium in the Antarctic has impressed us personally as being particularly good and rather a variation on the trend which our stories have been taking. Yet strangely enough it has met with considerable unfavorable criticism. You can draw a pretty good moral from the story entitled "World Atavism," for it often appears to take much longer to go forward on the road of improvement than it does to degenerate.—EDITOR.)

ONE ON JOHN W. CAMPBELL, JR.

Editor, AMAZING STORIES:

Having just finished reading "Skylark Three," and considering it the best story you have yet published, it was with somewhat of a shock that I read Mr. Campbell's criticism of the tale in the November issue, giving all kinds of reasons why the Skylark and the "green system" were impossible fabrications. But, what luck! One of Mr. Campbell's stories appears in the same issue and since turn about is fair play, maybe we can pick it to pieces.

Mr. Campbell's "molecular motion" ship might sound all right on paper, but I hardly think it sounds half as probable as Mr. Smith's atomic energy principle. For one thing, he states that the molecules continually drew heat from the surrounding atmosphere in order to retain their forward motion, and thus propel the ship. Now the way a colder substance draws heat from another by conduction is by the energy being transferred when the molecules strike each other in rapid movement. Thus, if all the molecules in a bar of metal were so affected as to move in the same direction, only the outside molecules would be struck by the molecules of the air, and they in turn could not transfer the necessary energy to the inner molecules because of the lack of Brownian movement.

Mr. Campbell also mentions the old "asteroid danger" that would menace a trip to the major planets. But I, for one, do not believe that the asteroids are half as plentiful as some writers would have us believe, for if they were they would form visible "rings" like those of Saturn. Then, too, the area of the plane of their orbit is more than 200 billion square miles giving them quite a chunk of space to roam in. And why not make the trip over or under them in some other plane than that of the planetary orbits? Of course, it would require a greater expenditure of energy, but both Dr. Smith and Campbell seem to have plenty of that.

But we have to hand it to Mr. Campbell for getting away from the old fallacious idea of vacuum walls for space ships. A vacuum between the walls would do nothing to prevent the escape of heat in space, since all a vacuum does is to prevent conduction of heat, while in space heat is lost only by radiation.

Also, there seems to be something "funny" about Mr. Campbell's analysis of the Venerian atmosphere. The chemical percentages of the various elements adds up to 118 per cent. What was he doing—figuring on terrestrial pressure as a basis?

Finally, the terrific "all-penetrating" gas used by Wade in the story sounds fishy to me. Even if it were able to penetrate all substances, could it not have been excluded by the simple expedient of increasing the air pressure in the beleaguered vessels?

But don't get the idea that I didn't like the story, "Solarite." It was very interesting, and quite worthy of AMAZING STORIES.

Glen Taylor,
802 South Kensington,
Kansas City, Missouri.

(It is quite interesting to see the problems brought out and the discussions excited by interplanetary stories. The magazine is supposed to be devoted to fiction and science combined. Certainly we know little about travel in space as yet that might be called science, yet such letters as this one show that interplanetary stories do involve a lot of science and give room for very interesting discussions. Mr. Campbell and Dr. Smith are both entitled to be called students. We know also that they are both very much interested in these columns.—EDITOR.)

AN APPRECIATION OF AMAZING STORIES. A READER'S PREFERENCES IN STORIES AND ARTISTS.

Editor, AMAZING STORIES:

I have been reading your magazine for three years, and I find it excellent. I think that your staff of artists is very good, but Wesso has the best technique. The story that I liked best in the December number was "The Drums of Tapajos." The stories that appeal to me most are the ones which concern chemistry. Next I like interplanetary, and lastly, biological stories.

L. McGeoghegan.
10 Home Street, Beverly, Mass.

(This very flattering letter will compensate for some of the "brickbats" thrown into our works. But of late they seem to be few. One peculiarity about them is that they sometimes condemn the very things, stories, illustrations or covers, that so many others consider the best. —EDITOR.)

THE MARVELS OF TECHNICAL TELEGRAPHY AND TELEPHONY

Editor, Amazing Stories:

I have been reading the A. S. over two years, so I feel I owe you a letter. I made the discovery of A. S. just in time to get in on the first of the "Skylark of Space." I was always deeply interested in science fiction, so I got quite a pleasant surprise when I opened up A. S.

After working in the Chicago Toll Test (testing station for long distant telephone lines) for some time I am no longer amazed by some of the things your authors say. By merely plugging in, and putting a voice frequency ring on a line some one will at once answer New York; or by choosing other certain lines I might ask some one in San Francisco how the weather is out there, or measure the gain or loss on a line to Phoenix, Arizona, as if I had the whole thing within arms reach. I might look into some trouble on some long lines which can have as many as twelve telegraph messages and three telephone conversations over the same four wires at the same time. It is done with voice frequency and radio frequency carrier waves. The interference of harmonics is about all that limits the number of conversations that can be put on a line. The robots of the telephone world, i.e., the dial systems, with their nearly thinking machine switching units are a story in themselves. Their connections with the manual boards is quite a trick also; as is the fact that one can operate a typewriter in one city, and have what he typed automatically printed in another city hundreds of miles away. Not long ago we had two-way television with conversation over a telephone line. The sending of pictures is quite common. Nearly all of this has been made possible within the last few years.

I just finished the second installment of "Skylark Three" and find it even better than the "Skylark of Space," but they are both in the same class; a class by themselves. However, Dr. Smith leaves us some dark mysteries sometimes. He has never told us what the force acts on, which is opposite to the one that drives the copper bar in the space car forward. There has to be a force of some kind equal to the useful force only in the opposite direction. Maybe he will tell us in the third part of "Skylark Three." Also, when Seaton tested out the zone of force for the first time, he did it in the atmosphere of the earth, and he later shows that the zone entirely destroys anything that runs into it. I'm afraid he would have created quite a wind storm in the immediate vicinity when he turned the zone on, for the molecules of air would be striking it with a pressure of about fifteen pounds per square inch. The moment they touched it, they would be destroyed, so the effect would be that of breaking a large vacuum tube, only instead of just a big pop, the air would continue to rush to fill the empty spot. However, in the story Crane and the girls stand near by, and calmly watch the silvery looking sphere rise quickly in the air.

While some of his speeds are mathematical impossibilities, they nevertheless make the story more interesting. I like the characters because they never say "I can't," and they never show a sign of giving up, no matter how hopeless the situation. In real life I doubt if they would always come out on top, but if the heroes were lost it would make that kind of story sad in more ways than one. Our villain is a bit inhuman, but it takes something extreme even to give Seaton any competition.

Wesso's illustration on the cover of the August issue is well done, but he made one rather noticeable error, although he may have done it purposely. He shows the cut which the Skylark made on the ship of the Fenechrones, as straight or flat as if the Skylark were a cube instead of a sphere. The Skylark was also supposed to have a zone of force around it. I hardly think Seaton would have cut it off so close to his intersection with the Fenechrone ship. Maybe Wesso did it to show the inside of the Skylark. I hope Dr. Smith never stops writing "Skylark Stories" as Seaton and Crane haven't explored a millionth part of the universe yet. Even if we have to wait two years for another one it would be worth it.

"Piracy Preferred" was well written and logical. I like all Campbell's stories. "The Green Girl" by Williamson was very interesting and romantic, although not very reasonable. However, I enjoyed it very much, as it gives the imagination a good workout. I also like stories by Breuer, Keller, Verrill and Vincent. I don't care so much for Keller's habit of liking to put babies in his stories, but maybe I haven't gotten far enough along in life to thoroughly understand them. I like a story in which the main characters are good scientists, who give as much technical detail of what they are doing as can be put in without marring the story. A fine appreciation of what is beautiful, and a little love story worked in tends to make the story much richer.

Needless to say A. S. is one of the best edited magazines on the market, and if it keeps its present high standard of only printing things which are of value, it is sure of a long life.

Myron A. Elliott,
919 West Market Street,
Taylorville, Ill.

(When a story excites such intelligent criticism as that which appears in your letter it is an indirect proof of its merit. It is seldom that an author receives so much praise for stories as has been awarded to Dr. Smith for his Skylark series. We hope you will not have to wait two years to hear again from Dr. Smith. He paid us a visit sometime ago and was evidently greatly pleased at the way his story has reacted on our readers. We hope you sooner or later will get to like babies as much as anybody. Dr. Keller certainly has a faculty of using them to great effect in his stories, although in many cases they do not appear there. We, too, think a touch of romance and love in science stories adds to their value as stories, but some of our readers object. —Editor.)

A BREEZY LETTER FROM TEXAS, WITH APPRECIATIONS FOR AUTHORS AND ARTISTS

Editor, Amazing Stories:

Well, your "severe critic" is writing you again! Partly because of Mr. Richard Rush Murray, and partly because I wish to compliment you on the October number.

As the editor and Mr. Murray will remember, I did not criticize Mr. Campbell's science. Mr. Campbell is, no doubt, an excellent scientist. There is not the slightest doubt in my mind as to that. But I disagree with the esteemed Mr. Murray on the topic that such long-winded explanations are in place in Amazing Stories.

In the first place, when a person comes home at night after working all or part of the day, and wants to read and enjoy the story he is reading, do you think he enjoys long explanations such as were made in "Piracy Preferred"? Of course not! He wants something entertaining. For an example: "Madness of the Dust." Adventure, suspense, action, and entertainment.

But to get back to my argument. Amazing Stories is supposed to live up to its title. A mess of explanations certainly isn't amazing. Amazing Stories is supposed to be entertaining. Explanations aren't entertaining. You get my point? That's enough of that.

As yet, I haven't even started "Skylark Three." Haven't had time. If it's as good as Wesso's illustrations, it must be good. "The Man Who Saw the Future," "The Prince of Liars," and "The Man From the Moon" were all excellent as can be. "The Dynasty of the Blue-Black Rays" was mighty good when you take into consideration that it's an archaeological story. Say! You better get us a sequel to "The Prince of Liars." That is, if you know what's good for you! "Written in the Year 2100" was good—as a story. But—if all the dust were removed from the air, life on this planet would be unbearable. Why? (1) During the sunlit hours, the dust keeps us from being burned to a crisp. It intercepts the rays of the sun, and weakens them. Otherwise—Bye-bye Blackbird! (2) During the sunlit hours, the dust collects and stores the heat it gets from the sun. At night, it radiates this heat and prevents us from being frozen into an Eskimo Pie. Of course, during the day, the dust is radiating heat, but it receives heat from the sun much *faster* than it can possibly radiate it.

If the next issue is as good as the forecast looks, it must be darn good.

Gabriel Kirschner,
Box 301, Temple, Texas.

(Your entertaining letter speaks for itself. The aspect of your opening paragraphs is rather in the line of unfavorable criticism, but you make amends for it. You certainly have picked out two excellent story tellers. We watch the work of our artists very closely, and we feel that they are working up to a higher standard. Their work is greatly affected by the story—if it appeals to them they get a sort of inspiration out of it, and this tends to give life to their efforts. —Editor.)

A NEW WRITER TO THE DISCUSSIONS COLUMN. CRITICIZES AND LIKES "SOLARITE."

Editor, AMAZING STORIES:

This is the first time I have entered your discussions column, but I am prompted to do so by a seeming inaccuracy which cannot be explained away even by poetic (?) license. I refer to "Solarite" one of the best constructed stories I have had the pleasure of reading in your excellent magazine. I have enjoyed the previous exploits of Arcot and Morey, and "Solarite" is among the best.

There is one point, however, where I think the author has slipped up, and that is in his invisibility ray. As I got it, the ray set the molecules of the ship *and its occupants* in motion, so that light passed through them without being reflected. This is natural and explainable enough, if one can conceive of such a ray being utilized. *But* the author has Arcot and Morey sit in their invisible ship and watch the progress of a battle. Now I contend that either Arcot and Morey were not themselves invisible, in which case the spectacle of four humans suspended in space would have been very disconcerting, or if they, too, were rendered invisible, that the light would pass through their eyes as it did through the rest of their bodies, and without leaving any image on the retina since the retina would be in a state in which it could not focus or reflect the images.

Also, since the whole ship was invisible, all the controls were invisible, and therefore such actions as going to the rear motor room and working controls there smacks of miraculous powers. It is a feat which might be accomplished by a blind man who had learned to do it blinded, but for a normal person to go suddenly blind, unable to see his hands or body, the floor, or any instruments, and unable to focus his eyes on any image outside their ship, it would require all of Arcot's multiple calculus to locate the enemy ship and blast it out of existence. Don't you think so?

Your authors are usually more careful about the application of their projected inventions. I hope, however, that all your stories will be as good as "Solarite."

James M. Hartley,
Wortendyke, New Jersey.

(Your remarks are interesting and are a real tribute to the story—they indicate that the story has greatly impressed you. Perhaps the author will answer your remarks. The retina of the eye has no focusing or reflecting functions; the image is focussed upon it as the pictured films are focussed on the screen, and it affects the optic nerve system, producing sight. Any lens is as invisible as it can be made, so the "Solarite" crew may have had less trouble than you think they had. The story is so realistic that it leads to realistic criticism.—EDITOR.)

TOO MANY INTERPLANETARY STORIES

Editor, AMAZING STORIES:

We have just completed "Skylark Three" in your October issue, and I think it's a Wow, but it's a little too unbelievable. How could a ship with a crew of Terrestrials go out into interstellar space and win a victory over a ship manned by hundreds of people, who are far superior mentally to the Terrestrials? At the rate of speed that the airboats on Norlamin went through the atmosphere, the air-friction would cause such terrific heat as to cause the ship to catch on fire and burn up.

On the cover of the September issue of AMAZING STORIES you have pictured a building presumably many stories in height torn from its foundations and hurled upward with great force without injuring the building at all. This is impossible; there is bound to be some defacing of the building, if at least very slight. Also, in your August issue, the first illustration of "Skylark Three" was totally wrong in every way. It showed the visiplate with a view of the ship of the Fenachrone on it, while in reality the Fenachronic ship had already been destroyed. If you will closely examine this illustration, you will no doubt discover these mistakes and perhaps more that I have not mentioned.

On the whole, your magazine is one of the best which we have yet seen. It is so different from other magazines printed on the same type of paper that we recommend that if it is possible that you print it on a better grade of paper. We are sure that if you do, it will increase its circulation tremendously.

Your cast of authors is remarkable. Never before have we seen so many good writers writing for one magazine. Your illustrations ar very good also except for a few mistakes.

The only mistake about your magazine is that all your stories are alike. Why don't you have some radically different stories once in a while to break the monotony of the astronomical stories you are now publishing?

Bill Blanton, Jr. and Marshall Smith,
1619 LaBranch St., Houston, Texas.

(You feel exactly as we do about our writers. It sometimes seems to us that they have a friendly feeling for us and like to see their work on the pages of AMAZING STORIES. We also have a feeling, based on the general realization of how the work is going, that AMAZING STORIES is getting to be better and better. We are giving a good many interplanetary stories, but these are what our readers ask for. But at the same time, we try to vary the stories in each issue as much as possible. What can we do when we get so many letters asking for interplanetary stories? You certainly cannot fail to find radically different stories in our columns.—EDITOR.)

A CHEERING LETTER FOR THE EDITORS OF AMAZING STORIES

Editor, AMAZING STORIES:

I have just finished the October issue. It seems that AMAZING STORIES is improving with each issue. Having received your magazine for over two years, I think I have a little knowledge of the facts of the case. This is the first time in months that I have read the magazine from cover to cover when it first arrived, but I guess that is a good point for you.

The stories in the October issue I would class as follows:

1. "The Dynasty of the Blue-Black Rays."

I put this story first because it was, in my opinion the most interesting; not too deep to grasp without a great deal of thinking. I like some stories that require thinking and again I enjoy a story not too technical.

2. "The Man from the Moon."

This story is second because it has the most perfect plot that I have seen for a long time, and the most convincing ideas of the moon.

3. "The Prince of Liars."

This story gave me a much better understanding of Einstein's conception of relativity, although I didn't care for the subject of bird-like people.

4. "Skylark Three."

This story, to me, was far from being as good as the "Skylark of Space"; it was too technical to be of great interest to one not "up" in scientific learning. The characters themselves were very life-like, but Seaton knew too much for one man, although he was a great hero.

5. "The Man Who Saw the Future."

This story was very p or considering the class of stories Edmond Hamilton usually writes.

6. "Written in the Year 2100."

I don't care much for stories that tell directly of the future or for letters from the future.

Well, enough for the October issue; it was almost excellent, but I'll leave some room for improvement.

I am glad to see that you are publishing, "The Drums of Tapajos." I consider Capt. S. P. Meek the best of your writers, especially for his story, "The Murgatroyd Experiment," which was the best I've read for some time.

Your illustrations are good; keep Morey and Wesso. I noticed Paul illustrated, "The Prince of Liars"; if you compare those drawings with those used in, "Skylark Three," a baby could tell the difference.

Robert Englehart,
804 Birch Avenue,
Harvey, North Dakota.

(The assigning to stories places in the order of their merit is interesting and certainly helpful to us. "Skylark Three" has been extremely well received by our readers. It is curious to see how differently the same story reacts upon different readers. We have a very high opinion of Captain Meek, which opinion we have not hesitated to express in these columns in the past. We sometimes think that we have no *best* writer. There are a half dozen of them that we put on the same plane of excellence, decided partly by our own feelings in the matter and partly by those of our readers. We hope to have our regular artists whose work you admire with us for many months to come. It takes a special quality of artist to illustrate stories like ours. It is not a simple matter, even for a good artist.—EDITOR.)

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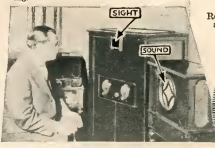

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